ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

OF THE

PROVINCE OF ONTARIO.

1899.

VOL. I.

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THE LEGISLATIVE ASSEMBLY OF ONTARIO

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TORONTO.

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VOLUME I.

VOLUME II.

TWENTY-FIFTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

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ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

FOR THE YEAR 1899.

GUELPH, December 30th, 1899.

To the Honorable JOHN DRYDEN,
Minister of Agriculture :

SIR,—I have the honor to transmit herewith the Twenty-fifth Annual Report of the Ontario Agricultural College and Experimental Farm.

In this Report the work of the year 1899 has been briefly reviewed under the following heads :

PART I. REPORT OF PRESIDENT.
PART II. REPORT OF RESIDENT AND ENGLISH MASTER.
PART III. REPORT OF PROFESSOR OF PHYSICS AND LECTURER IN ENGLISH.
PART IV. REPORT OF PROFESSOR OF BIOLOGY AND GEOLOGY.
PART V. REPORT OF PROFESSOR OF CHEMISTRY.
PART VI. REPORT OF PROFESSOR OF VETERINARY SCIENCE.
PART VII. REPORT OF PROFESSOR OF DAIRYING.
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PART IX. REPORT OF PROFESSOR OF HORTICULTURE.
PART X. REPORT OF FELLOW IN BACTERIOLOGY.
PART XI. REPORT OF EXPERIMENTALIST.
PART XII. REPORT OF MANAGER OF POULTRY DEPARTMENT.
PART XIII. REPORT OF LECTURER ON APICULTURE.
PART XIV. REPORT OF PHYSICIAN.

I have the honor to be, Sir,
Your obedient servant,

JAMES MILLS,
President.

THE ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

GUELPH, ONTARIO.

HON. JOHN DRYDEN, Toronto, Ont.
Minister of Agriculture.

JAMES MILLS, M.A., LL.D.	President
A. E. SHUTTLEWORTH, B.A.Sc., Ph.D.	Professor of Chemistry
H. H. DEAN, B.S.A.	Professor of Dairy Husbandry
J. HUGO REED, V.S	Professor of Veterinary Science
J. B. REYNOLDS, B.A.	Professor of Physics and Lecturer in English
C. A. ZAVITZ, B.S.A.	Experimentalist
WM. LOCHHEAD, B.A., M.S	Professor of Biology and Geology
G. E. DAY, B.S.A.	Professor of Agriculture and Farm Superintendent
H. L. HUTT, B.S.A.	Professor of Horticulture
F. C. HARRISON, B.S.A. (who has charge of Library)	Professor of Bacteriology
R. HARCOURT, B.S.A.	Assistant Chemist
M. W. DOHERTY, B.S.A., M.A.	Assistant in Biology
I. N. BECKSTEDT, B.A.	Assistant Resident Master
M. N. ROSS, B.S.A.	Fellow in Biology
W. J. PRICE, B.S.A.	Fellow in Agriculture
A. T. WIANCKO, B.S.A.	Assistant Librarian
W. R. GRAHAM, B.S.A.	Manager and Lecturer in Poultry Department
H. R. ROWSOM	Lecturer in Apiculture
CAPTAIN WALTER CLARKE	Instructor in Drill and Gymnastics
W. O. STEWART, M.D.	Physician
G. A. PUTNAM	Stenographer
A. MCCALLUM	Bursar

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PART I.

REPORT OF THE PRESIDENT

PRACTICAL EDUCATION.

Before proceeding to report on the special lines of work in which we are engaged, I wish to express in a word my gratification at the rapidly increasing interest which the people of this Province, and I might say of the Dominion, are taking in the subject of *practical* education,—domestic, industrial, and technical. After long and varied experience of scholastic and academic methods, the people are beginning to realize, as President Eliot of Harvard has said, that function and environment should ultimately determine education—that courses of study and methods of training should have reference to the work and surroundings of after-life, and should vary accordingly. Public opinion in this Province has not yet formulated the changes which it desires in the substance and methods of Canadian education; but it has resolutely come to the conclusion that, for economic and other reasons, it would be a mistake to go on educating the rank and file of our boys and girls, from five to sixteen or eighteen years of age, without any direct reference to the domestic duties or principal industries of the Canadian people.

During the past generation we have made rapid progress in education. We have spent large sums of money on schools and colleges, have raised the standard of qualification for teachers, and have endeavored to improve our methods. No doubt we have made real progress, on which we have congratulated ourselves from time to time; but as the scholastic ideal has become more difficult to reach and the scholastic demands on time have increased, our education has drifted farther and farther from the practical realities of every-day life. Of our girls especially, it may be truthfully said that we are educating them as if they were all destined to be teachers or ladies of leisure, with servants to wait on them and do their bidding from the day they leave school.

At length, however, a reaction has set in and we have a strong and rapidly growing demand for a more practical education in all classes of schools,—simple lessons in nature study and practical talks on housekeeping, with a thorough training in sewing, patching, darning, etc., in the public schools; more advanced lessons in nature study, a good course on domestic science, and continued practice in needlework, with suitable instruction in cutting and fitting simple garments in the high schools; and ample provision for manual training and technical education in all the larger centres of population.

These are some of the things which the people of this country need and are beginning to demand. The call has gone forth and the leaders of public opinion are beginning to move. Note the generous action of Sir William McDonald, of Montreal, in starting sample manual training schools in the different provinces of the Dominion, and the speeches of the Hon. G. W. Ross on technical education before the Board of Trade in Toronto and on domestic economy at the opening of the Institute of Domestic Science in Hamilton. Note also the reference to technical education in the speech of the mover of the address in reply to the speech from the throne in our Legislative Assembly a few days ago. We are pleased to see the demand and the first indications of response; and we hope soon to see the stately stepping of some one who is progressive enough, wise enough, and strong enough to crystalize into legal enactments the will of the people in this matter.

WORK AT THE COLLEGE.

The work at the College has gone on as usual during the past year, nothing specially noteworthy having occurred. Good work has been done in the different departments; and unbounded confidence in the growth and prosperity of the College has been noticed in the institution, among the ex students, and in a rapidly widening circle outside.

The usual number of excursionists under the auspices of the Farmers' Institutes (about 30,000) visited the College in the month of June—a result due, no doubt, to the increasing interest of the farmers in the work of the College, and to the well-known fact that they are made welcome and waited upon by the officers of the institution.

At the meeting of the Experimental Union in December, the 25th anniversary of the College was celebrated with pride and enthusiasm by officers, students, ex-students, and a number of visitors. The President reviewed the history of the College from the beginning to the present time, and a number of prominent men delivered appropriate addresses, including John I. Hobson, Esq., Chairman of the College Board ; Hon. Sheriff Drury, ex-Minister of Agriculture ; C. C. James, Deputy Minister of Agriculture ; and Prof. Robertson, Commissioner of Agriculture for the Dominion. The President's address (which appeared in *The Farmer's Advocate* of the 1st December, 1899) will be found in the report of the Experimental Union for the year.

Attendance of Students.

The attendance of students during the past year has been the largest in the history of the College. In fact, it has been considerably larger than can be accommodated in the present buildings,— 237 having registered in the regular course and 129 in the dairy course, or a total of 366. One hundred and three new students have entered for the regular course since the beginning of the present session in September, and the total number in this course has been fifty-one in excess of the present dormitory accommodation.

Ages and Religious Denominations.

The limits in age and the average happen to be the same as last year, ranging from 16 to 31 years and averaging 20 years. The dairy students, as usual, were somewhat older. The religious denominations were as follows : *Regular Course*,—87 Methodists, 77 Presbyterians, 30 Episcopalians, 20 Baptists, 8 Roman Catholics, 5 Congregationalists, 3 Disciples, 2 Christian Association, 2 Christadelphians, 1 Mennonite, 1 Greek Orthodox, and 1 Friend ; *Dairy Course*,— 64 Methodists, 30 Presbyterians, 17 Episcopalians, 7 Baptists, 4 Roman Catholics, 2 Congregationalists, 2 Lutherans, 1 Salvation Army, 1 Plymouth Brother, and 1 Evangelical.

Analysis of College Roll (*General Course*).

(1) From Ontario.

Algoma	1	Middlesex	10
Brant	4	Norfolk	1
Bruce	1	Northumberland	1
Carleton	6	Ontario	5
Dufferin	4	Oxford	9
Dundas	7	Parry Sound	2
Durham	2	Peel	2
Elgin	3	Perth	5
Essex	1	Peterboro'	4
Frontenac	1	Prescott	2
Glengarry	2	Prince Edward	2
Grenville	1	Renfrew	2
Grey	2	Russell	1
Haldimand	3	Simcoe	9
Halton	4	Stormont	2
Hastings	3	Victoria	3
Huron	12	Waterloo	6
Kent	1	Welland	6
Lambton	4	Wellington	14
Lanark	3	Wentworth	6
Leeds	2	York	13
Lennox	3	Toronto	12
Lincoln	7		
Manitoulin Island	2		197
Muskoka	1		

(2) From Other Provinces of the Dominion.

Manitoba	1	Prince Edward Island	3
Northwest Territories	1	Quebec	5
New Brunswick	2		
Nova Scotia	7		22
British Columbia	3		

(3) From Other Countries.

Bermuda	1	Jamaica	3
England	8	Asia Minor	1
Scotland	2		
United States	3		18

Total in general course. 237

The full College roll will be found with the appendices to this report, published in a separate volume.

County Students.

By an Act of the Legislature, each county council in the Province has power to send one student free of tuition. Of those on the roll in 1899, sixty were nominated by county councils, and as a consequence were exempt from the payment of tuition fees. The counties and districts which exercised the power of nomination last year (42 in number) were the following: Addington, Algoma, Brant, Carleton, Dufferin, Dundas, Durham, Elgin, Essex, Glengarry, Grenville, Grey, Haldimand, Halton, Hastings, Huron, Lambton, Lanark, Lennox, Lincoln, Middlesex, Muskoka, Norfolk, Northumberland, Ontario, Oxford, Parry Sound, Peel, Perth, Peterboro', Prescott, Prince Edward, Renfrew, Simcoe, Stormont, Victoria, Waterloo, Welland, Wellington, Wentworth, and York.

New Buildings and Alterations Needed.

The increase in the attendance of students has created the necessity for new buildings and some alterations in the buildings already provided. There is urgent need of about thirty additional dormitories; the physical laboratory has become too small for practical work with students in soil investigations and other branches of physical research; and the laboratory used in common by the horticulturist and biologist is now wholly inadequate for the work of the biological department in botany, zoology, and entomology. The classes are so large that they cannot be properly handled in either of these laboratories. Hence the repetition of last year's request for increased accommodation.

What has been suggested is as follows:

(1) That the portion of the main building now occupied by the library, library annex, and museum be converted into dormitories, which would furnish rooms for 45 additional students.

(2) That a large new building, costing about $35,000, be erected for the library, reading-room, a medium-sized assembly-room, the museum and geological cases, and an insectary for practical work in entomology, with class-room, offices, and laboratories for the department of biology, the library wing being fire-proof.

This would provide all that is required at present, except an addition to the physical laboratory.

English.

Most of the students at the college—and some of the very best—enter without having learned to speak and write good English. Hence we are still compelled to give a considerable amount of time to that subject. We do not aim at elegance, but we make an honest effort to secure clearness, correctness, and strength. We hope the time may soon come when we can insist on a higher standard for matriculation.

Physics.

The work in physics is increasing from year to year. In fact there is an unlimited field for investigation in soil physics; and our professor of physics has commenced several important experiments, but having to teach and work in the laboratory six or seven hours a day, he has very little time for systematic, continuous research. Hence I have recommended the appointment of a fellow in the department.

Biology and Geology.

We do not attempt an extensive course in geology, but a general outline of the subject, with special emphasis on Canadian geology, economic minerals, and soil formation. The lectures on this subject are given by the professor of biology.

In botany the course is broad and thorough, taking in all the branches of the subject and giving special attention to economic plants, noxious weeds, and injurious fungi, such as smut, rust, apple scab, etc. In zoology an outline of the animal kingdom is given, with more or less laboratory practice; and the work on entomology deals as thoroughly as possible with the beneficial and injurious insects found in the Province.

During the past year the work in the department, under Prof. Lochhead and his assistant, M. W. Doherty, has gone on as usual, notwithstanding the lack of room and the fact that Prof. Lochhead had to give a considerable amount of time to outside investigation of the San José Scale and to the fumigation of nursery stock in the Province.

Chemistry.

In addition to the ordinary class room and laboratory instruction, work has been done on two or three practical lines:

(1) An experiment in growing certain varieties of grain in cylinders, to test the relative effects of surface and subsoil watering, with a view to determining the importance of frequent surface cultivation for the preservation of soil moisture in dry weather.

(2) The analysis of sugar beets from different parts of the Province, in order, if possible, to settle the question as to the feasibility of manufacturing beet-root sugar in Ontario.

(3) The analysis of varieties of wheat and the making of bread therefrom, to determine the gluten content and actual value of each variety from the baker's standpoint.

(4) Digestion experiments, to determine the feeding value of Lucerne, cut at different stages of maturity. The results of these experiments will be found in a bulletin on Lucerne prepared and sent to the Department of Agriculture a short time ago by Robert Harcourt, the Assistant Chemist.

An account of these experiments, excepting the last, will be found in Dr. Shuttleworth's report (Part V of this volume), and also a description of a very valuable invention made by Dr. Shuttleworth while in Germany, whereby much more accurate and reliable analyses of plants of all kinds can be made than were possible with the apparatus previously used.

Veterinary Science.

Our veterinary department furnishes a good course of instruction, with considerable practice in the examination of horses for blemishes, the diagnosis of disease, and the administering of medicine. The work in this department during the past year has been much the same as usual; and the only thing specially noteworthy is that some of the time hitherto devoted to veterinary anatomy has been transferred to horse-judging; and the change in this respect has proved a popular one among the students, because they think it will assist them in determining the value of horses for their own use and in judging at the local fairs and exhibitions.

An account of the year's work and of the treatment of certain ailments among the live stock will be found in Part VI of this volume.

Dairy Department.

An extra course of three weeks in butter-making was given in the dairy school last year. The course began on the 1st December and was intended for makers throughout the Province, students in the regular college course, and others who could not attend during the longer session of twelve weeks, commencing on the 4th of January. This extra course was very well patronized, and the attendance at the school for the year was larger than usual, amounting to a total of 129.

During the remaining eight months of the year (when the school was closed), a considerable amount of experimental work in butter-making and cheesemaking was done, with special attention to the curing of cheese at different temperatures. For a full account of the work, see Part VII of this report.

FARM DEPARTMENT.

Some of the crops on the college farm were not so good as usual last year. The fall wheat was a complete failure, having been winter-killed to such an extent that scarcely a stalk was left. The other crops were fair, but not so heavy as in some previous years. Consequently the amount of feed for farm stock is somewhat less than was expected,—a circumstance which will be felt more than at other times, owing to the fact that we had not the usual sale of surplus stock last fall.

To our great regret, Mr. Wm. Rennie resigned his position as Superintendent of the farm 1st of October last. Having spent exactly six years at the college, and having in that time had an opportunity to fence most of the farm, clear up the broken portions, and illustrate his methods of cleaning and cultivating land, he decided to retire from the position, which he had found to be one constant anxiety, much labor, and great responsibility. During Mr. Rennie's stay with us he revolutionized the college farm, having cleaned it, improved its appearance, and increased its fertility; and, now that he is gone, I may be permitted to say that William Rennie is one of the very best cultivators of the soil to be found in this or any other country, and one of the most pushing and faithful workers I have ever met, devoting himself late and early, with untiring energy, to the duties of his position—never doing anything to glorify William Rennie but always willing to incur unpopularity, if need be, in the faithful and unflinching discharge of his duty. May he enjoy his well-earned repose!

As a young man, G. E. Day, B.S.A., discharged the duties of Professor of Agriculture and Experimental Feeder; and now, after time for development and more extended experience, he has taken entire charge of the Department of Agriculture (lectures, farm management, and experimental feeding), and it is hoped that he may be able to carry on successfully the work so well begun by Mr. Rennie.

For an account of the experiments in feeding cattle, sheep, and swine, see Part VIII.

HORTICULTURE.

The scope of the work in the Horticultural Department has been enlarged a good deal within the last few years. The orchards and small fruit plantations have been considerably extended and many variety tests have been made, including raspberries, blackberries, currants, gooseberries, strawberries, tomatoes, and a number of ornamental plants, especially geraniums and coleus.

The greenhouse branch, I need scarcely say, is one of the strong arms of the department. It furnishes the means of practical instruction in botany and horticulture during the winter months—almost the only months which we have for the purpose, as the farmers of the Province cannot spare their sons during the spring and summer months, when there are plenty of plants outside. If we could get our students in spring and summer, we should not need more than one or two greenhouses; but as it is we have to incur the expense of keeping up a full set of houses.

For an account of the work and experiments in the department, see Part IX.

BACTERIOLOGY.

By permission of the Minister of Agriculture, the Professor of Bacteriology went to Europe last summer to pursue certain lines of investigation further than was possibly in this country, intending to learn the methods and do a certain amount of work in the bacteriological laboratories in England (London and Cambridge), Switzerland, Denmark, Germany, Austria, France, and Italy. In his absence, the work was taken charge of by Malcolm N. Ross, B.S.A., fellow in the department, and was kept well in hand until Mr. Ross suddenly enlisted and left with the first section of the second contingent for

South Africa. Since Mr. Ross's departure, the laboratory (with the manufacture of tuberculin, etc.) has been in charge of Dr. E. W. Hammond, who came to us highly recommended by Prof. Adami, of McGill University.

During the year, Mr. Ross has spent a good deal of time on the investigation of roup in fowl, the bacteriology of cheese-curing, starters for cheese-making and butter-making, the causes of bitter milk, gassy curd, etc., and has given the results of his work in Part X of this report.

Field Experiments.

The work in field experiments at the College and throughout the Province has been carried on vigorously during the year. We have about forty-four acres devoted to testing of varieties of grain, corn, roots, potatoes, grasses, clovers, forage plants, fodder mixtures, etc., and to experiments in the selection of seeds, date of seeding, methods of cultivation, kinds of manure, and other things bearing on questions which arise from time to time among the farmers of the Province.

The work on the College experimental grounds is carried out very systematically, and the varieties which give the best results in tests of five or six years' duration at the College are sent out by the Experimentalist to be further tested by ex-students and others throughout the Province. Last year 3,845 co-operative experimenters, with 12,035 plots, assisted in this work—some in every county in the Province. The counties which sent the greatest number of satisfactory reports were the following:

Western Ontario—Grey, Huron, Bruce, Middlesex. *Central Ontario*—Simcoe, Ontario, Muskoka, Parry Sound District. *Eastern Ontario*—Hastings, Renfrew, Prince Edward, and Carleton.

For a full account of the work in the department, see the Report of the Experimental Union for 1899 and Part XI. of this report.

Poultry.

The continuity of the work in the Poultry Department was interfered with to some extent by a change in the management last spring. The present manager, W. R. Graham, B.S.A., entered on his duties on April 17th, when it was too late to control the hatch of early chickens for the year. Consequently he is not wholly responsible for the results of the year's operations; and it is due to him to say that the overdraft for the purchase of stock, etc., was not on account of purchases made by him.

Since Mr. Graham took charge he has given a good deal of attention to practical experiments in egg production, the preservation of eggs, the use of the cramming machine and the rearing, feeding and dressing of birds for home and foreign markets; and in order to assist him in his efforts to give the work of the department a distinctively practical bearing, we have erected a cheap but commodious incubator and brooder house for hatching and rearing early chickens to be fed for the British market.

For a brief account of the work done in the department during the last eight months, see Part XII. of this report.

Bee-Keeping.

Arrangements for lectures and experimental work in apiculture were made for 1899 as for some years past, but on the 22nd July Mr. R. F. Holtermann, who has had charge of the work, sent in his resignation, informing us of his decision to give up business and at once engage in evangelistic work. It was then too late to plan or undertake new experiments, and as a consequence we have to report only a brief account of the lectures as given by the new lecturer, Mr. H. R. Rowsom, in Part XIII. of this volume.

Gymnastic and Military Drill.

Most of our students devote a short time to gymnastic exercises during portions of the fall and winter terms. None of them are required to take military drill, but for years

past a considerable number have voluntarily taken a somewhat thorough course of training in rifle and battery practice, and I think the effect on their physique, manners, and general bearing has been clearly beneficial.

Class-Room Work.

The class-room work in the different departments has gone on as usual. Eleven candidates wrote for the B.S.A. degree in the University of Toronto, and nine of them were successful. A fair proportion of first and second year students gained a respectable standing in our College examinations; but the percentage of failures is still very large, resulting in some cases from idleness, but in most instances from a lack of early training in the elementary branches of an English education.

The third year examinations were conducted, as usual, by examiners appointed by the Senate of the University; and those of the first and second years by the professors and instructors of the College, with the assistance of Wm. Tytler, B.A., of Guelph.

Bachelors of the Science of Agriculture.

The examinations for the degree of B. S. A. were held in the month of May, and the successful candidates received their degrees at the commencement exercises of the University in June. The list is as follows:

Buchanan, J.	Hensall, Huron, Ont.
High, A. M.	Jordan Station, Lincoln, Ont.
Hutt, W. N	Southend, Welland, Ont.
Jarvis, C. D	Guelph, Wellington, Ont.
Mallory, F. R.	Frankford, Hastings, Ont.
Marshall, F. R.	Westbrook, Frontenac, Ont.
Murdoch, G. H.	Bobcaygeon, Victoria, Ont.
Price, W. J.	Marsville, Dufferin; Ont.
Raynor, M	Rose Hall, Prince Edward, Ont.

Recipients of Associated Diplomas.

*Brokovski, A. J	Battleford, N. W. T.
Crerar, A. H	Molesworth, Perth, Ont.
Crow, J. W.	Ridgeville, Welland, Ont.
Fawell, L. A	DeCewsville, Haldimand, Ont.
Goble, F. W.	Woodstock, Oxford, Ont.
Hutchison, J. R.	Escott, Leeds, Ont.
Hutton, G	Easton's Corners, Grenville, Ont.
Ketchen, J. B.	Brocklin, Ontario, Ont.
Kidd, O	Cookstown, Simcoe, Ont.
§Lewis, E R.	Burford, Brant, Ont.
Linklater, W	Stratford, Perth, Ont.
McCarthy, J. D	Norwood, Peterboro', Ont.
McIntyre, G. A	Renfrew, Renfrew, Ont.
McMillan, E J.	New Haven, P.E.I.
Mortureux, C E.M	Quebec, Quebec.
Peters, C. R	Elmhurst, N B.
‡Reid, R. H.	Reaboro, Victoria. Ont.
Robertson, J. A.	Blantyre, Grey, Ont.
Semple, W. C.	Tottenham, Simcoe, Ont.
Stewart, A.	Ivan, Middlesex, Ont.
§Vanatter, P. O	Ballinafad, Wellington, Ont.
†Wilson, R.	Fordwich, Huron, Ont.

* To take a supplemental examination in Chemisty.
§ " " " Literature
‡ " " " Chemistry and Entomology.
† " " " Physics.

First-Class Men.

The work of the College is divided into four departments; and all candidates who obtain an aggregate of seventy-five per cent. of the marks allotted to the subjects in any department are ranked as first-class men in that department. The following list contains the names of those who gained a first-class rank in the different departments at the examinations in 1899, arranged alphabetically:

First Year.

Harris, G. S., Toronto, Ont., in two departments; Natural Science and Mathematics.
Mills, P. G, Sussex, N.B., in one department; Mathematics.
Murray, J., Avening, Ont., in one department; Mathematics.
Pickett, B. S, Vittoria, Ont., in three departments; Natural Science, English, and Mathematics.
Russell, J. McK, Freeman, Ont., in three departments; Natural Science, English, and Mathematics.

Second Year.

Linklater, W., Stratford, Ont., in three departments; Agriculture and Live Stock, Natural Science, and English and Mathematics.
McMillan, E. J., New Haven, P.E.I., in three departments; Agriculture and Live Stock, Natural Science, and English and Mathematics.
Putnam, G. A., Guelph, Ont, in one department; English and Mathematics.
Robertson, J. A., Blantyre, Ont., in one department; Natural Science.

Scholarships.

Scholarships of $20 each in money were awarded for groups of subjects in first year work as follows:

Highest standing, with a minimum of 40 per cent. of the marks for each subject and an aggregate of 75 per cent. of the total number of marks allotted to the subjects in the group—

I. Agriculture, dairying, veterinary science, and poultry.—*Not awarded.*
II. Botany, bee-keeping, and horticulture.—*J. McK. Russell.*
III. Physics, chemistry, geology, and zoology.—*B. S. Pickett.*
IV. English literature, mathematics, book keeping, and drawing.—*J. Murray.*

Prizes.

Prizes were given as follows:

Essay on "Farm Hygiene"—$10 in books to *C. E. M. Mortureux.*

First place in general proficiency on first and second year work, theory and practice—$10 in books to *E. J. McMillan.*

Highest standing in general proficiency, with first class honors in one department, at University Examinations for B.S.A. degree—$10 in books to *W. J. Price.*

Cost of Agricultural Colleges.

In my report of last year, I ventured to state and undertook to prove that a strong and well equipped agricultural college requires a larger expenditure on capital and maintenance accounts than an equally strong and aggressive arts college or university. I think there can be no doubt about the correctness of the statement, and my reason for referring to the matter again is that I find some of our legislators still inclined to compare us in work and expenditure with the high school rather than with the arts college or university—I say "arts," because nearly everything done in Canadian universities beyond what is covered by the word "arts," is provided for without charge on university funds.

After years of observation, the leading states of the American Union are gradually coming to the same conclusion regarding the relative needs of agricultural and arts colleges. I could quote a score or more in support of my contention; but I shall refer to only three or four:

Agricultural College of the State of Wisconsin—

Annual expenditure, apart from erection of buildings	$60,000
Amount of salaries paid annually for a portion of the course.	28,000

Instruction in English, mathematics, and the natural sciences being furnished free by the State University at the same place:

Agricultural and Mechanical College of Iowa—

Annual expenditure, apart from buildings	$100 000
Annual salary bill	50,000

Four of the principal buildings cost as follows: Main building, $80,000; Agricultural Hall, $45,000; Morrill Hall, $38,000; and Margaret Hall, $50,000—nearly paid for by direct taxation. This was prior to January, 1899; and the following information, received a few days ago from a member of the staff of that institution, indicates the present attitude of the State Legislature:

"Our Legislature has been very liberal with us this year, much more so than with the State University; and, as it may interest you, I may say that they have passed a tax levy by which we get one-tenth of a mill on all taxes raised in the State for a period of five years, which gives us about $53,000 a year. They limited the maximum under this head to about $55,000 a year. In addition to this, we are getting for support and repairs, $31,500, for two years, and this will likely be increased. The buildings provided for are—engineering, $75,000; horse barn, $7,500; President's house, $7,500; and for the purchase of stock, $10,000"—all this for a college that has a regular income of $100,000 a year.

Agricultural and Mechanical College of Michigan—

Annual expenditure, apart from buildings	$108,900
Annual salary bill	42,500

This institution has a large number of expensive buildings and is still adding to its equipment. The State Legislature gave it $95,000 for a ladies' building last year.

The Legislature of Minnesota is still more liberal in voting money for its Agricultural College; but I must not occupy space with further quotation of figures.

Ontario Agricultural College and Experimental Farm—

Total maintenance expenditure of all departments of College, Farm, Dairy School, and Experimental Station	$57,433 56
Salary bill (included in total)	25,038 00

Financial Statement.

No profit and loss statement for the Farm Proper has been made out, because there was a change of superintendents on the 1st October, and we had not an opportunity to bring the Superintendent and Ex Superintendent together to make out such a statement. In the statement on the following pages I give the results of only the cash transactions for the year.

Ontario Agricultural College,
Guelph, December 30th, 1899.

JAMES MILLS,
President.

FINANCIAL STATEMENT FOR 1899.

I. COLLEGE EXPENDITURE.

(a) *College maintenance.*

1. *Salaries and wages*	$21,090 38	
2. *Food*:		
Meat, fish, and fowl	4,946 09	
Bread and biscuit	917 54	
Groceries, butter and fruit	5,039 57	
3. *Household expenses*:		
Laundry, soap, and cleaning	125 45	
Women servants' wages	1,907 61	
4. *Business department*:		
Advertising, printing, postage, and stationery	1,247 88	
5. *Miscellaneous*:		
Maintenance of chemical laboratory	367 29	
" physical laboratory	246 84	
" biological laboratory	244 35	
" bacteriological laboratory	318 63	
Library and reading room, books, papers, and periodicals	1,091 82	
Scholarships	100 00	
School assessment	140 40	
Unenumerated	478 34	
		$38,262 19

(b) *Maintenance and Repairs of Government Buildings.*

Furniture and furnishings	$867 08	
Repairs and alterations	1,254 29	
Fuel	3,155 91	
Light	1,056 23	
Sewage disposal	394 23	
		6,727 74
		44,989 93

College Revenue.

Fees	$ 2,336 45	
Balance on board accounts after deducting allowances for labor	6,086 78	
Gas used by students in laboratories	100 00	
Supplemental examinations	20 00	
Analysis of soil and water in chemical laboratory	25 00	
Chemicals and breakage in chemical laboratory	67 11	
Breakage in physical laboratory	7 85	
" bacteriological laboratory	10 10	
Refund of books lost by students	5 00	
Sale of oil to other departments	46 71	
" tuberculin	11 45	
" starters	2 30	
" old horse	32 00	
" scrap iron	6 95	
Contingencies—fines, breakage, etc	157 91	
		8,915 61
Net expenditure of College for year		$36,074 32

II. FARM EXPENDITURE.

(a) *Farm Proper.*

1. *Permanent improvements*—fencing, new water basins in stable, etc		$218 49
2. *Farm maintenance*:		
Salary of Superintendent (9 months)	900 00	
Wages of foreman and men	2,987 31	
Purchase of live stock—steers for feeding, etc......	1,749 95	
Maintenance of stock	539 75	
Seed	181 70	
Binding twine	31 88	
Repairs and alterations (blacksmithing, etc.)	389 12	
Furniture and furnishings	185 97	
Tools and implements	95 66	
Advertising, printing, postage, and stationery	61 60	
Fuel and light	26 76	
Contingencies	121 77	
		7,271 47
		7,489 96

Cash Revenue of Farm Proper.

Sales of cattle:		
24 steers—34,400 lbs. @ $5.50	$1,892 00	
3 bulls—$87, $77, $42	206 00	
5 grade cows—2 at $40, 2 at $30.50, 1 at $50........	191 00	
6 " calves—4 at $1 50, 1 at $2, 1 at $5	13 00	
8 pure bred calves (sale of 1898)	370 25	
Sales of pigs:		
7 pigs—1,615 lbs. at $5.00........................	80 75	
8 " 1,840 " 4.65........................	85 56	
6 " 1,015 " 4.10........................	41 61	
21 " 3,975 " 4.00........................	159 00	
6 " 1,232 " 3.90........................	48 04	
3 " 631 " 3.75........................	23 66	
1 " 235 " 3.50........................	8 22	
8 " 2,793 " 2.75........................	76 80	
11 old boars	19 97	
41 pigs (sale of 1898)............................	437 05	
Sales of sheep—25 sheep and lambs at $3 to $12	172 35	
" wheat—50 bush. at 65c........................	32 50	
" " 169½ " 66c........................	111 87	
" " 53.23 " 68c........................	36 28	
" " 190¾ " 69c........................	131 62	
" barley—202½ " 65c,40 bags at 20c,25 bags at 10c	142 15	
" oats—142.21 " 50c,31 bags at 20c,33 bags at 10c	80 80	
" peas—56.34 " 80c, 14 bags at 20c, 5 bags at 10c	48 55	
" potatoes—78.19 " 80c,18 bags at 20c,22 bags at 10c	68 45	
" wool—202 lbs. (unwashed) at 10c	20 20	
" " —230 " " at 12c	27 60	
" milk—2,945 lbs. at 67c. per 100	19 73	
" " —2,154 " at 68c. "	14 65	
" " —2,026 " at 70c. "	14 18	
" " —2,074 quarts at 4c.	82 96	
" hides—3 hides................................	5 63	
" old fence posts and boards.......................	7 75	
Rent of pasture	5 00	
Service of animals	168 00	
		$4,843 18

Net expenditure of Farm (allowing nothing for feeding of dairy stock, supplies to College, etc.)			$2,646 78

(*b*) ***Field Experiments and Experimental Feeding.***

1. ***Field Experiments.***

Salary of Director		$1,500 00	
Foreman		400 00	
Teamsters		532 50	
Wages of laborers		2,272 76	
		$4,705 26	
Seeds		344 82	
Manure and special fertilizers		139 80	
Furnishings and repairs (blacksmithing, etc.)		314 54	
Printing, postage, and stationery		126 65	
Tools and implements		69 87	
Purchase of horse		125 00	
Contingencies		19 16	
Net expenditure on field experiments			$5,845 10

2. *Feeding Experiments.*

Stock for feeding		$1,069 80	
Maintenance of stock		741 79	
Experimental feeder		360 00	
Repairs and alterations		32 10	
Postage and stationery		8 00	
Contingencies		8 65	
		$2,220 34	
Revenue.			
Sales of cattle—12 steers, 16,915 lbs. @ $5	$845 75		
" pigs— 5 pigs, 882 lbs @ $4.65	41 00		
" " —37 " 5,409 lbs. @ $4.37½	258 75		
" " — 5 " 840 lbs. @ $4.12½	34 70		
" " —42 " 5,982 lbs. at $4 00	239 28		
" " — 6 " 797 lbs. @ $3 75	29 89		
" " — 5 " 992 lbs. at $3.50	34 73		
" Sheep—13 sheep, 1,570 lbs. @ $5.00	78 50		
		$1,562 60	
Net expenditure on experimental feeding			$657 74

III. DAIRY DEPARTMENT.

(*a*) *Dairy School.*

Wages of instructors	$1,518 30	
Engineer (3 months)	90 00	
General helper (3 months)	90 00	
Board of engineer (3 months)	32 14	
Cleaning, painting, repairs, etc	287 01	
Dairy appliances— separators, vats, etc	631 32	
Expenses of cheese and butter judges	6 00	
Expenses inspecting factories	37 65	
Books, magazines, papers, etc	8 50	
Advertising, printing, postage, and stationery	112 95	
Fuel and light	313 97	
Purchase of milk for use in school	3,303 55	
	$6,431 39	

Revenue.

Sales of butter—9,113½ lbs @ 20 to 23c	$1,990 05		
" cheese—13,192¼ lbs @ 7 to 10½c......	1,059 40		
" skim-milk—19,410 lbs. @ 10c	19 41		
" whey—part make	10 00		
" cream—1½ qts. @ 20c	30		
		$3,079 16	
Net expenditure of dairy school			$3,352 23

(b) Experimental Dairy.

Salary of butter maker		$558 72	
" cheese-maker (9 months)......................		500 00	
" engineer and assistant in experimental work (9 mos.)		270 00	
" cattleman and assistance in milking		520 37	
Temporary assistance		35 00	
Purchase of milk for experimental work		1,508 74	
Purchase of cows......................................		394 53	
Feed and fodder		577 53	
Furniture, furnishings, and repairs		901 73	
Advertising, printing, postage, and stationery		58 40	
Laboratory expenses		17 49	
Fuel and light		302 19	
Contingencies		267 13	
		$5,911 83	

Revenue.

Sales of butter—5,100 lbs. @ 14 to 22c	$1,965 64		
" cheese—13,482 lbs. @ 6 to 11½c.......	1,276 01		
" milk—38,756 lbs. @ 75 to 97c per 100	364 45		
" " —1,566 qts. @ 4c	62 64		
" skim-milk—68,230 @ 10 to 15c per 100.	70 64		
" whey—season's make................	37 50		
" cream—120 qts. @ 15c...............	18 00		
" " —96½ qts. @ 20c	19 30		
" cattle—16 cows....................	440 00		
" calves—2 pure-bred calves	30 00		
" " 12 grade calves.................	30 95		
" separator	25 00		
" wagon............................	45 00		
" appliances—3 vats and 2 curd knives...	25 75		
		$4,410 88	
Net expenditure of experimental dairy......................			$1,500 95

IV. POULTRY DEPARTMENT.

Salary of manager....................................	$633 33	
Temporary assistance	11 40	
Purchase of stock	181 10	
Feed, etc	235 94	
Furnishings, repairs, etc..............................	299 20	
Fuel and light	68 94	
Contingencies	71 42	
	$1,501 33	

Revenue.

Sales of poultry—106 birds @ 50c to $5	$130 25		
" dressed poultry—9 pairs	5 25		
" " —36 chickens, 130 lbs. @ 8c	10 40		
" eggs for setting—$40\frac{8}{12}$ doz. @ $1.00	40 70		
" " —$61\frac{2}{12}$ doz. @ 1.50	91 75		
" eggs—$249\frac{1}{2}$ doz. @ 11 to 25c	34 45		
		$312 80	
Net expenditure of poultry department			$1.188 53

V. HORTICULTURAL DEPARTMENT.

1. *Permanent improvements*—new iron staging in greenhouse			124 35
2. *Maintenance*—			
Salary of head gardener and foreman		$650 00	
" assistant gardener and florist		528 00	
" assistant in greenhouses		291 78	
Teamster		348 00	
Wages of laborers		1,417 71	
Manure and fertilizers		92 01	
Seeds, bulbs, plants, and trees		251 90	
Implements, tools, furnishings, repairs, etc.		613 58	
Fuel and light		407 84	
Contingencies		176 37	
		4,777 19	

Revenue.

Sale of berries—$454\frac{1}{2}$ boxes @ 4c.	$18 18		
Sale of vegetables	2 95		
Incidentals	9 05		
		30 18	
			$4,747 01
Net expenditure of department (nothing having been allowed for fruit, vegetables, etc., supplied to the College)			$4,871 36

VI. MECHANICAL DEPARTMENT.

Salary of foreman (9 mos.)	$524 97	
Extra carpenter and builder	699 96	
Tools	48 88	
Fuel and light	22 74	
Expenditure of mechanical department		$1,296 55

SUMMARY.

Total net expenditure:		
I. College and government buildings	$36,074 32	
II. Farm:		
1. Farm proper	2,646 78	
2. Field experiments	5,845 10	
3. Experiments in feeding	657 74	
III. Dairy department:		
1. Dairy School	3,352 23	
2. Experimental Dairy	1,500 95	
IV. Poultry Department	1,188 53	
V. Hort. Department—gardens, orchards, lawn, arboretum, etc	4,871 36	
VI. Mechanical department	1,296 55	
Total net expenditure in 1899		$57,433 56

Total sum voted for 1899, $57,967.

PART II.

RESIDENT AND ENGLISH MASTER.

To the President of the Ontario Agricultural College:

Sir,—I beg to submit the following report of my work during the past year.

My chief duties in the residence have been presiding in the dining-hall of the college, superintending students' studies, inspecting the college furniture, and seeing that rules and regulations have been carried out.

Regarding the dining-hall, I am pleased to be able to report that a very fair degree of order and decorum has been maintained, the students generally having shown a disposition to accept advice, and act on the suggestions that have been given from time to time. With the accommodation and service that we have in connection with the boarding department, the conditions are probably as satisfactory as could be expected.

In superintending students' studies, I have visited the students' rooms at least once each evening, and have seen that the study-period has been favourable to close application. With few exceptions, the students have been careful to observe the regulations of the college regarding study. With reference to the effect of systematic study, I may say that many students, who, on entering the college, found it difficult to read and think continuously during the period set apart for study, have developed, through practice, considerable power of application.

Regarding the college furniture, I am glad to be able to report that in only one or two instances have I had to deal with cases of wanton defacement; and that there has been very little damage of any kind. The fact that there has been such slight damage is very gratifying, as the care of the college property has been felt as a great responsibility.

With reference to discipline, I wish to say that a majority of the students have manifested a spirit of self-government which has made it comparatively easy to maintain order in the residence. It has been my constant aim to encourage this spirit of self-government in every way; for I have thought that moral education lies mainly along the line of self-government.

My class-room work comprises lectures in English Grammar, Composition, Mathematics, Drawing, and Book-keeping. In giving instruction in these subjects, I have met from three to four classes each day during the two terms.

Our work in English has been practical in its bearings, only such technical points as seemed indispensible having been introduced. Special attention has been given to syntax as being, from a practical point of view, the most important part of grammatical study. The writing and correction of fortnightly essays, and the punctuation of typical sentences, have also formed an important part of our work in English.

The course in mathematics has also been very practical, comprising the measurement of land, lumber, timber, masonry; mensuration, with special reference to the properties of the triangle and circle, and the determination of the cubical contents of such solid figures as the sphere, the cylinder, prisms, and the cone and pyramid, with their frusta; a pretty thorough drill in vulgar fractions and decimals; and a fairly extensive course in commercial arithmetic.

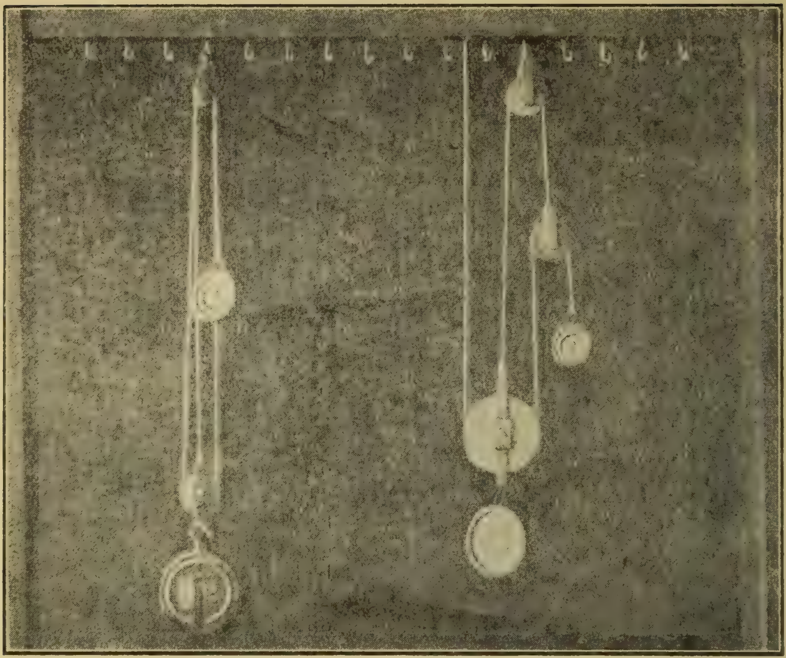
The work in drawing comprises the drawing of plans of barns and outbuidings, some drawings original, others from models; and geometrical drawing, comprising figures, such as might occur in connection with the mechanics of the farm.

The course in book-keeping comprises commercial forms, business correspondence, and the keeping of practical accounts.

Respectfully submitted,

I. N. BECKSTEDT,
Resident and English Master.

Ontario Agricultural College,
Guelph, Dec. 30th, 1899.



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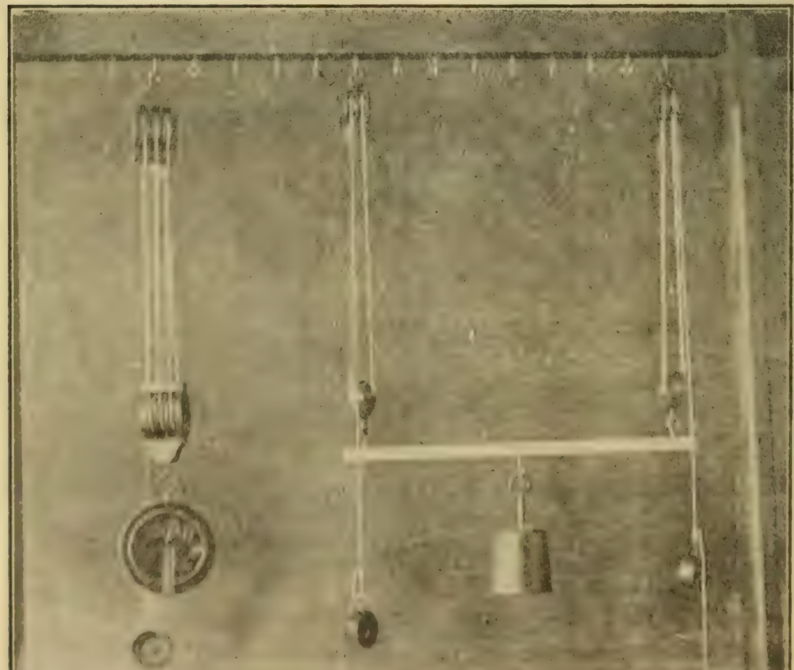


No. 3. No. 4.

PART III.

PROFESSOR OF PHYSICS

To the President of the Ontario Agricultural College:

Sir,—I have the honor to present herewith my report on the work in the departments of English literature and physics.

English Literature.

Under this head I have but little to report. The students in all classes continue to show an encouraging interest in the study of English literature for its own sake, for its liberalizing and culturing influences. We are, I think, doing all that should be done in this study. But we are decidedly weak in two regards, one of them coming especially within my department. I refer first to the instruction and practice given in the writing of essays, and secondly to the preparation and delivery of speeches. In the past we have done very little in the former, and nothing in the latter. Much more time than is at present given to practical instruction in composition could profitably be spent on that subject. I try to keep before the minds of the students, as an ultimate object, the preparation of articles and papers for the agricultural press and for institute lectures. But this cannot be done without much practice on their part and much drilling and correcting on the part of the teacher.

As to practice in speaking, the College Literary Society is to be highly commended for the initial step it has taken in this matter. Last year the society offered five prizes for a public contest in oratory. The number of the competitors, and the excellence of the speeches delivered, showed that we have exceedingly good material at the college for the making of good public speakers It seems to me that the college should second the efforts of the literary society by affording some kind of instruction in this important accomplishment. And the most feasible plan that occurs to me is to establish seminary classes in connection with each department of instruction. Each professor might, say once a month, assign a topic to be discussed at some subsequent lecture period, naming certain members of the class as leaders in the discussion. In that way their powers of expressing might be cultivated in connection with practical themes, and thus we might pave the way for each student to take a similar part in larger spheres and on wider questions.

Instruction in Physics.

First Year.—*Mechanics* comprises a study of various mechanical appliances, such as pulleys, levers, jacks, and their application to the work of the farm. Often implements are allowed to stand out of doors all the year round for want of space in the implement shed or elsewhere. All the implements on the farm may be stored in a small shed, if the whole space is utilized. By means of proper appliances implements may be hoisted and suspended from the ceiling. By similar means, grain, meat, barrels of fruit, and other heavy things may be handled with ease, and thus many a hard lift saved.

In the instruction in mechanics each student is required to study many different kinds of labor-saving devices, and to find out the advantages and uses of each. This work is done in the winter term, and consists partly of lectures in the class-room but mostly of practical work by the students themselves.

Two handy appliances for raising implements, carcases, etc.—No. 1 consists of a sheaf at the top containing two pulleys, and a single pulley below. It will be seen that one pound balances three pounds: that is, a weight of 300 pounds can be raised by a force of little over 100 pounds. This appliance will raise an object from the floor to the ceiling.

With three separate pulleys on hand, No. 2 is a very convenient arrangement for raising weights a short distance. It will not raise an object more than half way to the ceiling, but is more powerful than No. 1, the advantage being 4 to 1.

No. 3 is a very useful system of pulleys. It consists of two sheaves, each containing 3 pulleys. A single long rope serves. It is powerful—6 to 1—and will raise an object to any desired height.

No. 4 is an excellent model of an arrangement for hoisting large implements to the ceiling of an implement shed. It consists of 2 pairs of sheaves, each sheaf containing 2 pulleys. By this means two men can hoist almost any implement to the ceiling with ease.

SECOND YEAR.—*Surveying*, comprises a six weeks' course in measuring land areas of regular and irregular shapes, chaining over hills and past obstructions, erecting perpendiculars, and taking levels previous to laying drains. This is mainly outside practical work, done in the fields or on the lawn during October and part of November.

The Physics of Liquids and Gases.—This opens the very large question of conveying water from springs, wells and other sources, to farm buildings and to the farm house. The various methods are discussed,—the pump, the windmill, the siphon, the hydraulic ram, and the suitability of each method to the different circumstances that may be found. In this connection I discuss with the class some questions relating to water-conveyance that have been received from farmers in this Province, and in this way we cover, in a practical fashion, a variety of circumstances and the best method of dealing with each.

Also, under this head come some of the most important questions in soil physics, such as the moisture of the soil, soil air, and the relation of drainage, cultivation and fertility to these two essentials. In illustration of these questions, a series of experiments is conducted by each student, one afternoon a week throughout the winter term.

Electricity.—In the winter term the subject of electricity receives some attention, chiefly in the direction of electrical machinery.

THIRD YEAR.—The third year work in this department consists mainly of advanced reading, lectures, and practice along the same direction as in the second year, with additional work in weather and meteorology observations, and a series of experiments in soil temperatures, a sample of which experiments is given later in my report. Also the special students in agriculture make complete examinations of some typical soils, experimenting with a view to determine the behavior of these soils towards water, air, and the heat of the sun, and making a physical analysis to show the amount of sand, clay, and humus, the condition of the humus, whether immediately available for plant food or not, and the texture of the soil generally. And the special students in dairying receive a course in the physics or dairy products, and in the principles of refrigeration, cold storage, and the control of temperature and moisture in the cheese room.

THE INFLUENCE OF SURFACE CULTIVATION ON THE MOISTURE OF THE SOIL.

This work is a continuation of the experiments described in the report of last year. Two plots, to all appearances identical in their conditions, were chosen for the experiment, the surfaces being subjected to different treatments. We took the plots in hand after they had been cultivated and harrowed ready for seeding. The surface of the one plot was first rolled, and throughout the season was kept smooth and compact, while the surface of the other was first carefully loosened and pulverized to the depth of about three inches. This operation on the second plot was repeated through the entire season whenever a crust was observed to have formed. It was noticed particularly that a crust would form frequently when there had been no rain since the previous cultivating. An ordinary dew is sufficient to form a perceptible crust.

Although these plots contained each only one square rod and were side by side, yet we found, on taking the first sample for the determination of moisture, that the subsoils were quite dissimilar, varying from a fairly compact nature to one quite loose and open. As a consequence of this difference in the subsoils, the per cent. of moisture at the beginning of the experiment, determined before the plots were prepared finally, was as follows: No. 1, surface, 26.7 per cent.; subsoil, 18 per cent. No. 2, surface, 25.05 per cent.; subsoil, 15 per cent. On account of this large difference, we at first thought it advisable to choose another locality, but finally decided to continue the work on this spot, and to choose for our cultivated plot No. 2, with the poorer subsoil, and determine to what extent surface cultivation can overcome natural disadvantages.

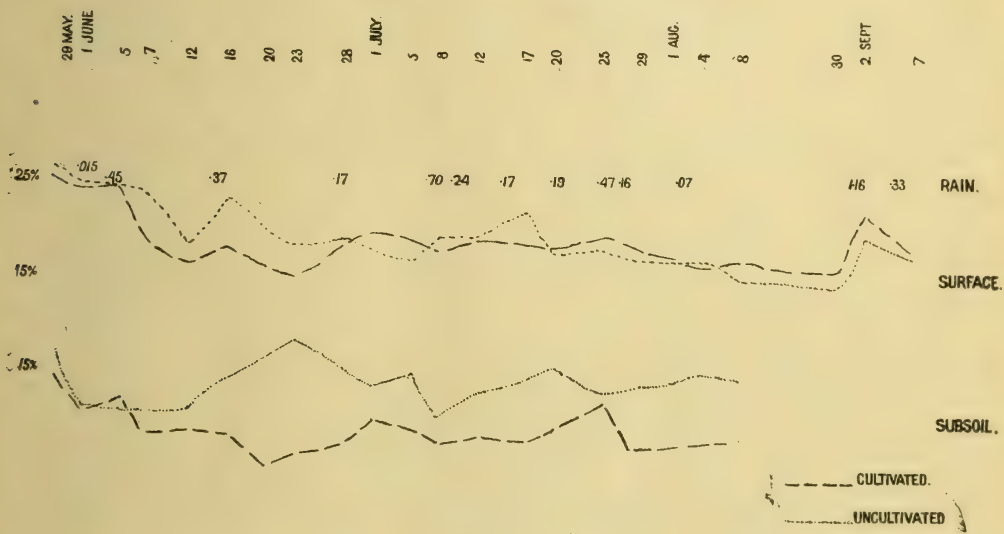
No. 1 plot, then, receives no cultivation after it has first been rolled. The surface is kept firm and smooth. It has a good subsoil, capable of holding a large supply of water, from which the surface will draw in dry weather.

No. 2 plot is cultivated frequently, the object of cultivation being to prevent the formation of a crust and to keep the surface fine and loose, and thus to prevent the water

from below from finding its way to the surface and evaporating. But this plot has a very open, sandy subsoil, with a low water-holding power, and hence the surface of this plot has a much poorer reserve from which to draw in time of drouth.

The results are presented in a graphic form in the accompanying chart. The dotted lines represent the curves of moisture for the surface and subsoil of the uncultivated plot, and the short strokes show the curves for the cultivated plot. The dates on which the determinations were made are recorded in the line across the top, and the second cross-line of figures are the amounts of rainfall for the season.

The lower diagram contains the subsoil curves for the two plots. The per cent. of moisture varies mainly from 5 to 15 per cent., and the superiority of the subsoil of plot No. 2 is quite apparent from the diagram. This subsoil containing a much larger amount of moisture throughout the entire season, on account of its texture, the surface soil above it has a greater reserve from which to draw during a dry spell. This constitutes the superior advantage of plot No. 2, and, other things being equal, plot No. 2 should contain a much larger per cent of moisture, especially in a dry spell, since No. 1 has a very poor reserve supply on which to depend.



Noting now the upper diagram, we observe that No. 2 begins with a higher per cent. of moisture, and keeps the advantage during the month of June. On June 28th a slight rainfall has a depressing effect on the uncultivated plot, while careful cultivation on the other plot succeeds in preventing evaporation, and on July 1st, for the first time, the cultivated plot comes to the fore. Between July 5th and 17th considerable rain falls, and the more compact subsoil belonging to No. 2 helps in preventing this water from leaching away. Consequently, at this period the curve of No. 2 comes again to the top, but it soon loses this advantage, and after August 4th, and all through the extreme drouth of August, the curve of No. 1 stands above the other. Without surface cultivation, the opposite would undoubtedly have been the case.

These results confirm those of last year as to the importance of frequent shallow cultivation during dry weather.

We find also that where the crop has not a good retentive subsoil, from which to draw reserve supplies of moisture in dry weather, surface cultivation will partly or wholly compensate for this deficiency

In practicing surface cultivation it is important to stir the soil as soon as possible after a shower, else, the mulch being destroyed by the rain that has fallen, evaporation will go on so rapidly as to leave the soil, in a very short time, drier than before the rain.

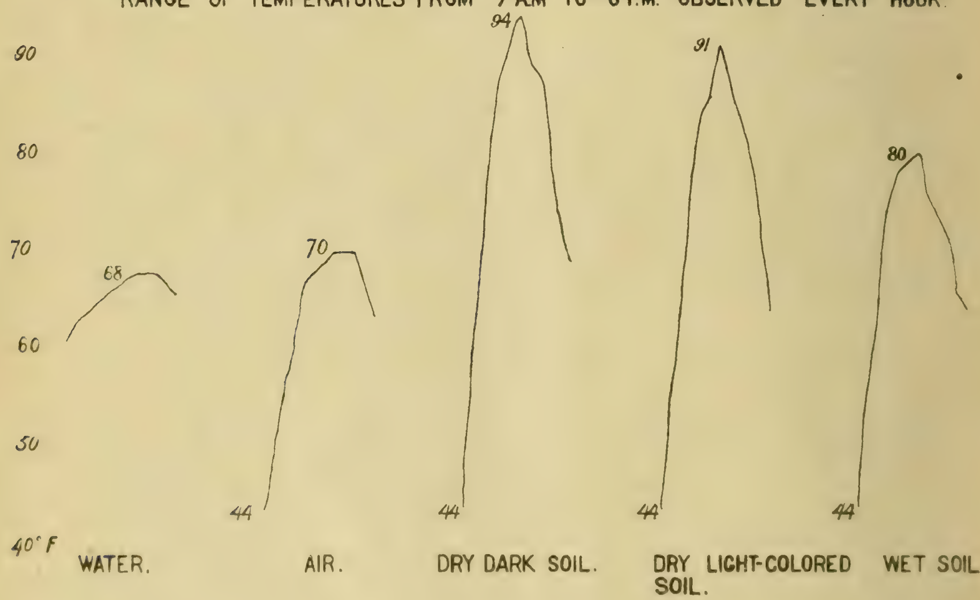
Some Observations on Soil Temperatures.

The accompanying chart shows the results of one day's observations on soil temperatures. It is given here for the sake of two practical conclusions that may be drawn from it.

Some soils in large pans were set in the open air, near a large body of water, and the temperatures of the soils, the air, and the water, were observed each hour, beginning at 7 a.m. and concluding at 6 p.m. They were all exposed to the action of the sun's rays. The water rose from 61 to 68, reaching 68 at 2 p.m. It then fell to 66 by 6 p.m. The air rose from 44 to 70, reaching its highest at 2 p.m., and then fell by 6 o'clock to 63.5. The soils all began at the same temperature as the air, namely 44; all the soils reached their maximum at one o'clock, and from that time declined rapidly. The highest temperature reached by the dark soil was 94, by the light colored soil 91, and by the wet soil 80.

The practical points illustrated by the above differences are: *first*, the advantage of *thorough draining*, and secondly, the advantage of having *a sufficient supply of humus*, in the soil.

RANGE OF TEMPERATURES FROM 7 A.M. TO 6 P.M. OBSERVED EVERY HOUR.



Quick Germination.—Badly drained land remains wet and therefore cold for a long time in the spring. This wetness prevents early seeding, and prevents quick germination after seeding. This year, in connection with our co-operative work, we have demonstrated, in a number of tests, that early sprouting is followed by a better crop than late sprouting. Our chart shows that a dry soil goes from 11 to 14 degrees higher than a wet soil under the same circumstances. Heat is necessary to rapid germination. Hence to insure a *quick germination*, the *surplus water* must be *drained* from the soil in the spring.

Secondly other things being equal, the *dark soil will be warmer* than the light-colored soil. In our diagram, we see that the dark soil rises 3 degrees higher than the other, both being dry. Now the *dark color* is imparted by the *vegetable matter* in the soil, and the light color indicates an absence of humus or vegerable matter. And while humus is added to the soil principally because of the plant food it furnishes, it can be seen that it confers other important benefits in helping to warm the land in the spring, and hence in hastening germination.

Protection from Lightning.

A correspondent calls our attention to the fact that considerable destruction of property is being wrought by lightning, and inquires as to the steps being taken by a community in insuring proper protection from this source of danger.

The relative destruction of property in the country districts is immensely greater than in the towns. Isolated barns and houses, with few or no trees near to avert or divide the force of the stroke, are much more liable to be struck than town buildings. On August 12th, severe thunderstorms passed over various parts of the Province, and the detailed reports of the same, as given in two of the Toronto daily papers, are as follows :

Near Lindsay, barns containing grain from 100 acres struck and burned. Victoria Road, barn and contents struck and burned.

Penetanguishene, lumber yard struck and partially burned.

Alliston, two large barns struck and burned with the year's crops.

Woodstock, barn struck and destroyed ; the last of the season's grain just gathered in.

Near Barrie, barn struck and burned.

Near Colwell, residence struck and burned.

These are eight instances of destruction of property by lightning ; six of them are barns. As these accounts are all that could be found relating to destruction of property in the two dailies of August 14th, it is fair to assume that 75 per cent. of the buildings struck in two days' storms, over an area including Woodstock, Barrie and Lindsay, are barns very likely isolated, and most if not all of them filled with the season's unthreshed grain.

In addition to these cases, a number of lives were destroyed, of men and cattle, on the same days and by the same agency. The distribution of these fatalities is both serious and interesting.

Near Lindsay, Township of Ops, some cows and sheep killed ; Cameron Village, eleven sheep killed.

Near Picton, one person killed and two others severely shocked while in the field drawing in grain.

Near Brougham, one person killed while standing under a tree, seeking shelter from a storm.

In these there are no instances of fatality in a town, but all occurred either in the open field, or near objects which drew down the death-dealing bolt. On the same occasion several trees in the town of Barrie were struck, but there is no account of persons or buildings being struck. The apparent inference from the two events above recorded is that a tree may be a protection, if it is not too close.

Are Barns More Liable to be Struck when Filled than when Empty?

There is good reason for believing, from actual statistics and for other reasons, that barns filled with hay and unthreshed grain afford an easier path for a lightning discharge than empty barns do. According to a report of the United States Weather Bureau, the loss of barn property in the month of August is very much greater than in any other month of the year, although thunderstorms are not much, if any, more prevalent in August than in any other summer month. And August, both in the Northern States and in Canada, is the month of overflowing barns.

Is any Sort of Protection from Lightning Effective?

From the instances given above it may be inferred that buildings grouped together are mutually protective. The neighborhood of trees is also a safeguard if the trees are not so close to the building or person as to cause a side-flash. To be in the neighborhood of a tree may be safety, to be too near it or under it is danger.

Regarding protection of buildings by lightning rods, Sir William Thompson—Lord Kelvin—one of the greatest living authorities on this question, says : "We have strong reason to feel that there is a comfortable degree of security, if not of absolute safety, given to us by lightning conductors made according to the present and orthodox rules."

Professor Oliver Lodge, in his book "Lightning Conductors and Lightning Guards," says : "Almost any conductor is probably better than none, but few or no conductors

are absolute and complete safeguards. Certain habits of lightning-rod practice may be improved, and the curious freaks and vagaries of lightning strokes in protected buildings are intelligible without any blame attaching to the conductor; but this is very different from the contention that lightning rods are unnecessary and useless. They are essential to anything like security."

In a bulletin published by the United States Weather Bureau, the case of the Washington monument is cited as follows: "Eight years have now passed since the alterations were made, and the monument stands uninjured. Unquestionably, standing as it does 555 feet high, in the centre of flat, well-watered ground, it constitutes a most dangerous exposure for lightning flashes. No better illustration of the value of lightning conductors can be asked.

Professor Lodge gives the following rules for the erection of lightning conductors:

1. That iron is the best metal to use in conductors.

2. That conductors should be continuous, and that all unavoidable joints should be soldered.

3. That several points are preferable to a single point, hence ordinary barbed wire, as affording innumerable points, is recommended.

4. That greater surface than is usual with present practice, should be given to earth connections.

5. That periodic inspection is most important.

What Insurance Men say About Lightning Rods.

By corresponding with a large number of insurance companies in this Province, the writer has elicited some rather valuable opinions and facts regarding the protection of farm buildings by lightning conductors. The majority of these companies believe that lightning rods are a safeguard if properly put up, but add that they are often either badly installed or are allowed to get out of repair. All the companies corresponded with were unanimous in stating that they made no reduction in rates in favor of buildings protected by lightning rods. So that, whatever may be the possibilities of lightning rods as safeguards, the disregard of principles and the lack of thoroughness on the part of those who have had the work to do have made the system, in the eyes of practical men, of doubtful utility.

Summary.

1. An isolated object is more liable to be struck than a group of objects.

2. Barns are most likely to be struck when filled with grain or hay.

3. Trees afford protection to objects standing lower, unless the trees are too close.

4. Lightning conductors, when properly installed and kept in good repair, afford a good degree of security.

5. The essentials of a good lightning conductor are:—(*a*) numerous points—either as terminals or as projections of conductors. These give constant relief to the electric strain in the atmosphere and tend to prevent the accumulation of a destructive charge; (*b*) a continuous metallic conductor, with as few joints as possible. Unavoidable joints should be soldered perfectly. Imperfect joints, like ice on the overhead wire of an electric railway, cause flashes, and these flashes may set fire to the building; (*c*) a good earth connection, that is, the lightning rod should be conducted to moist earth below the perpetual moisture line. A good earth connection can be made by using a wire rope as conductor, opening out the ground end of the wire into a brush and spreading the brush over as large an area of earth as possible; or by splicing to the main conductor below the ground surface a number of wires running in different directions, so that one or more of them may be sure to be in contact with good earth.

6. Before intelligent farmers can be expected to expend their money in purchasing lightning rods, they must receive a reliable guarantee that the work will be properly done. A feasible arrangement might be the appointment of a county or township inspector, employed by the municipality to inspect in that municipality.

Report of Precipitation and Temperatures for the Year 1899.

The highest temperature recorded at the college for the year was 95° on August 19th. The lowest was 20.5° below zero, on February 12th.

The amount of precipitation for the year, including rain and melted snow, was very nearly 20 inches. Below is a table giving the precipitation for each month, and the highest and lowest temperature.

Month.	Temperatures.				Precipitation.
	Highest.	Date.	Lowest.	Date.	
January	48	5	—10	11	.68 inch.
February	46	27	—20.5	12	.77
March	61	22	1	21	2.00
April	80	29	18	4	1.00
May	78	1	31.5	15	3.10
June	86	5	42	10	.64
July	89	3	49	30	1.93
August	95	19	43	9	.24
September	85	17	28	23	3.00
October	76	13	25	3	4.10
November	57	18	22	12	.73
December	52	1	—13.5	30	1.58

Cold Storage and Refrigeration.

The time has come when the students in dairying and horticulture especially should be instructed in the principles of cold storage and refrigeration. If our graduates are to assume responsible positions in the fields of labor, in which, at the college, they have made a special study, they must be more or less familiar with modern methods of storing, preserving and marketing perishable products. In dairying and fruit-farming cold storage has become more or less of a necessity. Any instruction that is to be given in this matter, so far at least as the principles are concerned, must be given in the Department of Physics. I therefore take this opportunity of recommending that a refrigerating plant be installed adjacent to the college proper, to be used for the following purposes:

1. To provide cooling rooms for experiments in butter and cheese.
2. To provide cold storage in connection with the horticultural department.
3. To provide cold storage for the experimental feeding department, so that individual animals may be slaughtered at the right time, and the carcases kept until the whole batch is ready for scoring.
4. To provide cold storage accommodation for the College store-room.
5. To afford an opportunity for experiment and instruction on this subject, in the department of Physics.

If all of these interests were considered in one undertaking, a much more efficient plant could be installed than if two or three small affairs were built in connection with the several departments. This matter of a refrigerating plant will, I think, deserve your early attention.

I have outlined elsewhere the amount of instruction given in the department of Physics. Altogether, in English and Physics, my work is as follows :

First Year.—Two lectures a week in Physics, in the winter term. Two lectures a week in English Literature, throughout the year. Correcting occasional compositions.

Second Year.—Two lectures a week in Physics, with demonstrations that involve previous preparation of apparatus, throughout the year. Practical instruction in Physics, in addition to lectures, two afternoons a week for the whole year. Two lectures a week in English Literature. Correcting weekly essays, from October to February. After that time the second year students employ the time allotted to essays in writing their theses.

Third Year.—Two lectures a week in Physics in the fall term. Two afternoons a week in practical instruction for the year. Three lectures a week in fall term, and two a week in winter term, in English Literature. Correcting of essays prescribed in the circular. Directing students in original work required for the preparation of theses. I have four of the present third year conducting their theses work under my direction—two in Agriculture and two in Dairying.

There is a growing demand on my department for the analysis of soils, a demand coming from farmers in the Province. This work I am entirely unable to do in the winter time, when most of the samples are sent in. To be satisfactory, this work should be attended to promptly. Four soils were sent in a few days ago for analysis, but I could do nothing with them except to give a very general report. Since a physical analysis of soils reveals so much that is decisive, showing the texture, the degree of fertility, and the availability of plant food in the humus form, it is imperative that this department should be provided with the means for attending promptly to soil analysis.

In addition, I have been trying to carry on original investigations in soil physics during the summer. Last summer and the summer before, with the valuable assistance of Mr. R. D. Craig, B.S.A., whom a provisional appropriation enabled me to employ, experiments on the cultivation of the soil in relation to moisture were conducted. The results of this work are outlined elsewhere. The results of the co-operative experiments were obtained with the same assistance.

If the departments under my charge are to do the work that will be demanded of them, in lectures, demonstration, correcting of essays, analysis of soils, and original investigation, permanent assistance must be provided. In each of my last two reports I made a recommendation that a Fellow or an assistant be appointed to this department. Unless really valuable work for the College and the Province is to be neglected, this assistance should be provided at once. I hope that it will be possible for you to enable me to begin the next year with the departments under my charge well equipped for broad and useful service.

Allow me to thank you for the generous and hearty encouragement accorded to me personally, and for the liberal appropriations toward the purchase of apparatus and supplies.

Yours respectfully,

J. B. REYNOLDS,
Professor of Physics.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, Dec. 30, 1899.

PART IV.

PROFESSOR OF BIOLOGY AND GEOLOGY.

To the President of the Ontario Agricultural College:

SIR,—I beg to submit herewith my second report as head of the Biological Department.

The year 1899 was a busy one with this department. Regular and systematic instruction was given in four distinct branches, viz., Botany, Zoology, Entomology, and Geology; a large correspondence was conducted with persons asking help in the identification and treatment of insects and weeds; the fumigation method of treating nursery stock in the nurseries of the Province was inaugurated; consultations were frequently held with the scale inspectors regarding the identification of scales; a bulletin on the San José and other scale insects was prepared; experiments in the spraying of mustard, and the fumigation of granary insects were made; papers were read at the meeting of the Entomological Society of Ontario, held in London, October 11th and 12th; two short addresses were delivered to the students of the Toronto Normal School on "Nature Study;" and special studies were made on certain new insect and weed pests.

INSTRUCTION.

Laboratory work forms the basis of all instruction given in this department, and it should be borne in mind that such work done, even under most favorable conditions, throws a large amount of additional labor on the instructors.

The building at our disposal is wholly inadequate for the needs of the work. The lack of laboratory accommodation is perplexing and annoying, as the room is far too small, and is unsuitable for the purpose, hence the classes must be divided into sections and the work repeated. This repetition of work for different sections of the same class consumes the time and energy of the instructors, leaving no time for the preparation of next day's work, nor for correspondence, while research work and the reading of scientific magazines and bulletins are simply impossible. If two or more large and properly equipped laboratories were provided for this department, not only would the students get better instruction, but the instructors would also get the time which should be theirs, for reading and preparation.

The work of instruction is very onerous on account of the number of subjects to be taught. In the general courses two lectures are given every day to the First Year students; one lecture every day to the Second Year students; and one lecture every day to the Third Year students, throughout the year. In addition, courses of lectures are given in Cryptogamic Botany, Physiological Botany, Histology, Fungi and Fungous Diseases and Zoology to the specialists in Biology and Horticulture. Six lectures a day are delivered on the average throughout the year, while every afternoon and Saturday morning have their classes, which require constant supervision and preparation.

The First Year students get no practical laboratory instruction in Zoology or Geology; the Second Year and Third Year students do not have the amount of practical work in Entomology which is so desirable; yet it is difficult to see how the amount of practical work can be increased without additional room, time and assistance.

I may say, moreover, that a large portion of my assistant's time is devoted to the preparation of material in general Histology, and the Histology of Fungi and general Cryptogamic plants, which required the full time of an assistant when Prof. Harrison had the work in charge.

Correspondence.

This phase of our work has again assumed large proportions, and as a consequence much time and research are required. Over five hundred letters and two hundred circulars were sent out during the year 1899. This department is being freely consulted by the fruit growers, farmers and others in all matters pertaining to weeds, plant diseases, and insects, and frequently the nature of the inquiries necessitates considerable research and lengthy replies.

My assistant has had also considerable correspondence in connection with the distribution of sets of weed seeds, work which Prof. Harrison handed over prior to his leaving for Europe.

In consideration of the large correspondence, the demand for special articles on biological subjects by the agricultural press of the Province, and the various annual reports for the College, and the entomological and other societies, a typewriter would be of much service, and I would respectfully ask that one be secured for use in the Biological Department.

Fumigation of Nursery Stock.

On the passing of the Fumigation Act by the Legislature in April last, the Hon. the Minister of Agriculture asked me to take charge of the work of inaugurating the system of fumigation of nursery stock in specially constructed air-tight buildings. With the assistance of Professors Harrison, Reynolds and Shuttleworth, all the nurseries of Ontario were visited and the nurserymen instructed how to build suitable fumigating houses, and how to fumigate with hydrocyanic acid gas.

The chemicals used in fumigation were sent out from the College to the different nurseries in quantities suitable to the size of the various fumigating houses.

The work of inspection of the nurseries occupied nearly the whole month of April, and interfered to some extent with the closing weeks of the college term. The fumigation of nursery stock in the autumn also involved considerable time, and much correspondence was necessary to get information from many nurserymen as to the effects of fumigation on exposed stock.

Identification of Scale Insects.

During the progress of the inspection of the orchards of Ontario for the location of the San José Scale, many inspectors and orchardmen sent specimens of scale for identification. As official entomologist, I was obliged to be extremely careful in naming the scale sent, for sometimes much depended on my report. In every case the specimens of scale were subjected to treatment to render them transparent and suitable for examination with the high powers of the microscope.

The *Ostreæform Scale*, a recent importation from Europe, which had been previously reported from only a few places in North America, was found to be quite common in some sections infested with San José Scale. This work of identification of scales occupied most of my time during the months of August and September.

A Bulletin on the San José and other Scale Insects of Ontario.

The San José Scale Commissioners, who were appointed by the Government to inquire into the operation of the San José Scale Act in Ontario, made a recommendation in their report to the Government that a bulletin be prepared, which would give the main facts regarding the habits and life history of the San José Scale and other scales of our orchards. Accordingly the Minister of Agriculture asked me to prepare a bulletin along the lines suggested by the Commissioners for distribution to orchardists. This bulletin I have prepared, and have submitted to the Minister for approval. Illustrations of the common scales of the orchard have been made, so that the intelligent orchardist will be able, with the help of the descriptions in the text of the bulletin, to identify any scale which he may find in his orchard. This bulletin, I trust, will also be of use to the future inspectors of scale in our orchards, as I have inserted many items of information regarding scales, which will make them observe more intelligently and decide more confidently than they have hitherto been able to do. The work of identifi-

cation of scales in late summer and the observations made during my trip with the Scale Commissioners were of great service to me in the preparation of this bulletin.

Spraying to Kill Mustard, and Fumigation to Kill Granary Insects.

Several series of experiments were tried in England last year on the use of copper sulphate and iron sulphate solutions, applied in the form of a spray, for the eradication of wild mustard. Outlines of these experiments are to be found in the May 27th, June 24th, and August 5th issues of Field, the great English agricultural weekly. In the majority of these experiments, a weak solution of copper sulphate was found very efficacious.

During the past summer my assistant, M. W. Doherty, used a knapsack sprayer, and applied solutions of different strengths of copper sulphate and iron sulphate to mustard plants growing in a field of oats. Only one strength (1.25 per cent. solution) of iron sulphate was tried, with the result that the mustard was not entirely destroyed and no injury was done to the oat crop. A 4 per cent. solution of copper sulphate (4 lbs. of copper sulphate dissolved in 10 gallons of water) was found very effective in destroying the mustard, and caused very little, if any, injury to the grain crop; but a 2 per cent. solution of copper sulphate (2 pounds dissolved in 10 gallons of water) was found to be the best strength to use. The oats showed practically no injurious results from the application, even at the time of spraying, while the mustard was completely destroyed. Two weeks later the oats which had been browned slightly by the spraying were as bright and green as those of the unsprayed portions of the field; and when the sprayed oats were ripe the straw was over six inches longer than that which was unsprayed. It is probable that the best results can be secured when the mustard and oat plants are young.

During the coming summer the experiments will be repeated on a larger scale, and on several kinds of crops. A special spraying apparatus has been designed for the work, and it is probable that the machine will be placed on the market during the year 1900.

From the good results obtained by the use of hydrocyanic acid gas in the destruction of the San José Scale and other orchard insects, it was thought advisable to try the effects of the gas on grain-infesting weevils found in granaries. Two tall glass jars, with ground stoppers, and with a capacity of 625 cubic inches each, were used as air-tight compartments in which the insects were treated to the gas. In jar No. 1, which was kept beside a warm radiator in my office, was placed a package of corn badly infested with active grain weevil and cadelle. In the first experiment the insects were treated for three hours to the same strength of hydrocyanic acid gas as was used in nursery fumigation. In jar No. 2 a similar package of infested corn was placed and treated, but the insects had previously been rendered torpid by exposure to a cold of 40 degrees Fahr. for an hour. The gas treatment was continued for three hours at this temperature, and when the jars were opened and the insects taken out and brought into a warm room, fully 95% of those in jar No. 1 failed to show signs of life even after a period of 24 hours, while 95% of those in jar No. 2 revived and became active.

These experiments were repeated, using twice the usual strength of the gas. When the jars were opened at the end of 24 hours all of the insects in jar No. 1 were dead, while fully 10% of those in jar No. 2 showed signs of life, revived, and became active in again in 24 hours, although they had been exposed to a temperature of 14 degrees Fahr. for a whole day.

The results of these experiments show plainly that torpid grain insects are very difficult to kill with hydrocyanic acid gas, but that they can be killed readily in rooms warm enough to render them active. The use of this gas cannot, then, be recommended for winter treatment in either granaries or mills.

Papers Read Before the Entomological Society.

I attended the annual meeting of the Entomological Society of Ontario which was held in London Oct. 11th and 12th. The most prominent feature of the proceedings was a discussion of the San José Scale problem by Prof. Webster of Ohio, Dr. Fletcher of Ottawa, Mr. John Dearness, Deputy Minister James, Mr. G. E. Fisher and myself. At the conclusion a resolution was adopted expressing approval of the efforts made by the

Minister of Agriculture to rid the Province of the pest. I read two papers before the Society, entitled "Notes on Some Insects of our Coniferous Shade Trees" and "The Asparagus Beetles in Ontario." At a public meeting, held on the evening of Oct. 11th, I gave an address on "Insect Pests of the Garden, Orchard and Farm," which was illustrated by stereopticon views of the insects discussed. The Society honored me by electing me Vice-President and a member of the editing staff of the *Canadian Entomologist.*

Nature Study.

In my report of last year I stated as follows: "The present drawback to the introduction of nature study into the public schools lies in the fact that the majority of teachers in rural schools are not sufficiently equipped for the work of instruction. To overcome this difficulty, leaflets might be prepared by this department and issued to teachers to show how Nature-study may be presented to the pupils." These words still hold true in so far as the equipment of the teachers for the work is concerned; but there are indications that point to an improvement along those very lines in the near future. The teachers of the normal schools of the Province are interesting themselves in the work, so that ere long courses of nature-study for teachers will likely be given. One teachers' association has taken the work in hand, and is endeavoring to organize a summer course of study in elementary botany, entomology, geology and physics. Another teachers' association has provided its members with the best works on nature-study, and has had special lessons on nature topics taught from them. The agricultural papers of the Province are publishing articles on Agricultural Instruction, which will be widely read by the farmers.

In furtherance of the great scheme of nature study, I had the honor of giving two talks on insects to the students of the Toronto Normal School on the occasions of their visits to the college, one practical lesson on evergreens to the Guelph city teachers, and another practical lesson on the cabbage butterfly to the pupils of the Marden public school, Wellington county.

I have also prepared an illustrated nature-study leaflet on the cabbage butterfly, which will appear in the forthcoming annual report of the Entomological Society.

Prof. C. C. James has happily said: "Keeping close to nature as it is right at home, in the fields, along the roadsides, in the running brooks, looking for the simple workings of laws all about us, not trying to fathom the far-aff problems of some remote science; starting right at our feet with the simplest things of life about us, and getting down to the explanations of so-called common things, is the key to the situation." To do this there must be intelligent, enthusiastic teachers, who can make the common things of nature plain and intelligible to the pupils. It is the duty of this college to further this grand work of indirect agricultural education, not only by giving practical lessons to teachers and classes of pupils, but also by furnishing information about the common objects of nature in the form of leaflets.

New Insect Pests of the Year 1899.

Several insects made their appearance in Ontario in somewhat alarming numbers, and many inquiries were made as to the best methods of dealing with the new arrivals. I shall now treat very briefly of a few of the worst.

(1) The Asparagus Beetles (*Crioceris asparagi*) *and* (*C. duodecempunctata*). In 1898 the arrival of these beetles at the Niagara River was noted, and it was then predicted that they would soon be with us.

For over forty years these pests of asparagus have molested the market gardens of certain portions of New York State, especially Long Island. In 1862 the common asparagus beetle (*C. asparagi*) occasioned the loss of over one-third of the crop in Queens County, the loss being estimated at $50,000.

These two beetles arrived in Ontario at the same time, although they had different starting points and were introduced into the United States at different times. At present the common asparagas beetle is the more abundant and destructive.

Fig. 1, shows very clearly the form and markings of the beetle, egg, larva, and pupa, of the common asparagus beetle (*C. asparagi*). The beetle is blue-black in color, with red markings on the thorax and wing covers, and passes the winter under sticks and rubbish on the ground. About the first week of May it leaves its winter quarters and deposits eggs on the fresh, succulent shoots of asparagus. The eggs are placed in rows of

FIG. 1. Asparagus Beetle (*Crioceris asparagi*); *a*, adult beetle; *b*, egg; *c*, young larva; *d*, larva, full-grown; *e*, pupa. (Chittenden, Year-book of Dept. of Agriculture for 1896.)

four or five, are nearly one-sixteenth of an inch long, and are dark-brown in color. The eggs hatch in about a week; the bodies of the grubs are gray; the head and the three pairs of legs are black. In twelve days the grubs are full-grown, when they enter the ground, surround themselves with a cocoon and become pupæ. In another week the adult beetles emerge. It will be seen that about 30 days are required for this beetle to develop from the egg to the adult stage.

FIG. 2. Twelve Spotted Asparagus Beetle (*Crioceris 12-punctata*); *a*, adult beetle; *b*, full-grown larva.

Fig. 2 shows very clearly the form and markings of the twelve-spotted asparagus beetle (*C. 12-punctata*), and its larva. The beetle is orange-red in color, with black markings on the wing covers. The grub or larva when full-grown is about one-third of an inch long, and of an orange color. The life-history of this species is not yet thoroughly known, but it is generally supposed that the eggs are deposited on the stems of the asparagus. These beetles, like those of the other species, feed upon the stems and leaves.

Remedies.—(a) The Long Island practice is to "cut down all plants, including seedlings and volunteer growths, in early spring, so as to force the parent beetles to deposit their eggs upon new shoots, which are then cut every few days before the eggs have time to hatch from the first brood."

(b) Some permit shoots to grow as trap plants which are cut down every week so as to destroy the eggs deposited upon them.

(c) Insecticides are frequently employed when neither of the first two remedies is practicable. The best applications are lime, pyrethrum powder, and paris green. The lime should be fresh, and air-slaked; the paris green may be mixed with flour, and applied dry to those shoots which are left uncut. All shoots should be treated with paris green after the cutting season.

(2) THE DIAMOND-BACK MOTH (*Plutella cruciferarum*) was quite destructive to turnips in several localities. Although not a new arrival in Canada, this is the first time that its occurrence in Ontario has been noted in large numbers, and over a large area.

The caterpillars are green in color, and are beset with short jet-black hairs. When full grown they are nearly half an inch long. They eat holes in the leaves, which soon become very tattered and torn. A very characteristic feature of this insect is the thin gauzy cocoon, which the full-grown caterpillar spins on its changing into the chrysalis.

Dr. Fletcher reported an outbreak at Ottawa in 1889. From the observations made then he was led to believe that there are probably three broods each year, and the last brood passes the winter in the chrysalis state. Experience with this pest in England and the United States has proved that it may be very troublesome one year, and difficult to find the next. In Canada, it was very abundant at Victoria, B. C., and Winnipeg, in 1885, but has not been reported as serious since. It was quite serious at Regina in 1887, and at the Ottawa Experimental Farm in 1889, but not reported as serious from those districts since.

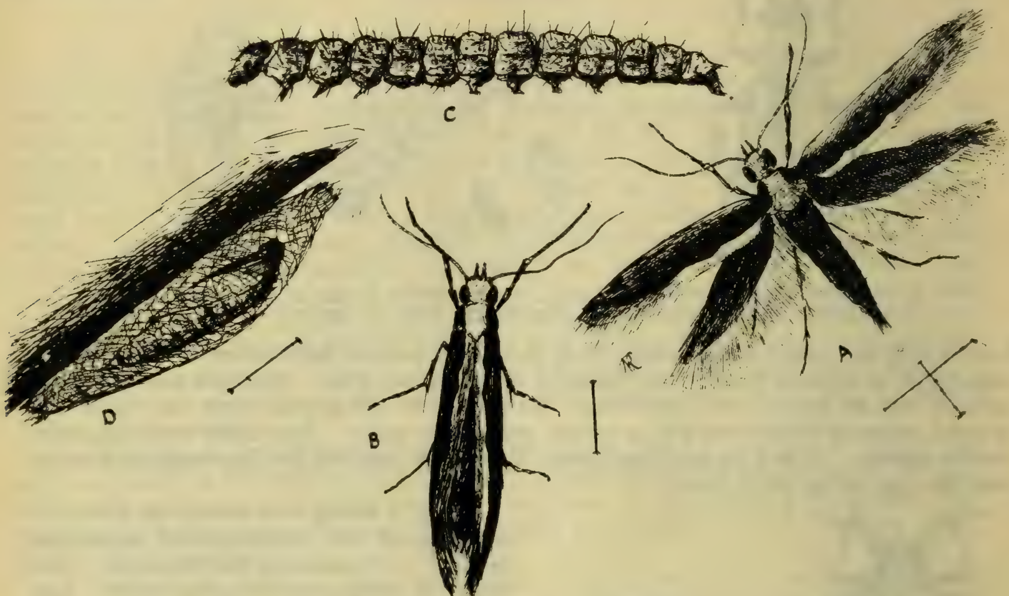


FIG. 3. *Plutella cruciferarum* (Diamond-back Moth); *a*, moth, showing the long hairs on the wings and the markings; *b*, moth with wings folded, showing the diamond-shaped area; *c*, larva or caterpillar; *d*, gauzy cocoon with chrysalis within. (Original.)

Remedies.—Remedial treatment is never absolutely effective when large fields of turnips are infested. The treatments which have met with the greatest amount of success in England are: (a) Swish off the caterpillars from the leaves with a stick, and spread broadcast by hand a liberal supply of gas-lime or soot. (b) Dust dry upon the leaves an application of paris green mixed with either flour or land plaster, whenever young turnips are effected by the first or second brood of caterpillars.

(3) THE PEA LOUSE.—There was an outbreak of this pest in York County in the last week in July. A correspondent wrote as follows:

"I have about eighteen acres of peas smitten with lice, and I do not think they will fill. The lice are much like the turnip lice, and occur in large spots where the stems are dying. I would like to know what is best to do with them." So far as I am aware this is the first recorded occurrence of a louse affecting peas in Ontario. As I did not see the infestation, I cannot tell which species was doing the damage. Prof. Johnson of Maryland reports a terrible outbreak in that state during the past summer, the loss being estimated at over $3,000,000.

"The standard remedy for plant lice, and plant-bugs is kerosene emulsion; and as the pea and bean infesting species feed chiefly on the under sides of the leaves of these plants an underspraying is necessary."

(4) THE CORN APHIS OR LOUSE (*Aphismaidis*). Ordinarily this louse is not troublesome, but during the drouth of the months of August and September corn was seriously affected by it. Fig. 4 shows the appearance of this louse. When plants have become weakened by drouth or otherwise, they become very susceptible to attacks from plant-lice and other parasites.

FIG. 4. *Aphis maidis* (Corn Louse); *a*, winged female; *b*, wingless female; *c*, pupa. (After Forbes of Illinois.)

Remedy.—No direct, practicable remedy has yet been found for the prevention of the ravages of the corn louse. Good farm practice, however, will do much towards lessening the extent of the depredations of plant-lice in general, for it is a well-known fact that healthy, vigorous plants are seldom injured by these insects. Whenever plants become weakened in vitality from lack of fertility, drouth, or neglect, plant-lice are very liable to appear in large numbers. "Therefore, if the farmer gives special attention to the fertility and drainage of his land, procures the best seed, and, by proper planting and cultivation, secures vigorous plants from the start, and by proper care endeavors to keep them in this condition until the product is matured, he will have accomplished more in preventing loss from insect depredations than he would accomplish by the best remedies known, applied to half-starved, neglected plants."

New Weed Arrivals.

(1) A very serious pest has made its appearance in the south-west counties of the Province within the last few years. I refer to the Prickly Lettuce (*Lactuca scariola*).

This is an annual weed which has been introduced from Europe, and has spread to all parts of the United States. It is a winter annual; it springs from seed in the fall, and survives the winter. It is distributed by means of its seeds, which are readily blown long distances by the wind. The plant begins to bloom in July, and produces a few blossoms each morning thereafter until killed by frost. An average plant has been estimated to bear 8,000 seeds.

The best methods of destroying the weed are:

(*a*) To mow repeatedly as it comes into bloom, or earlier. This process will eventually subdue it.

(*b*) To cultivate thoroughly with a hoed crop; by this method the seeds in the soil will be induced to germinate. They should not be covered deeply in plowing, as this would simply bury the seeds and prevent them germinating. Mature plants should be cut down and burned, lest the seeds be blown about and scattered by the wind.

Farmers should be careful to buy only clean clover, millet, and grass seeds, and the weed-inspector should insist on the fulfillment of the law, and have all fence-corners, roadsides, and waste lands cleared of the pest.

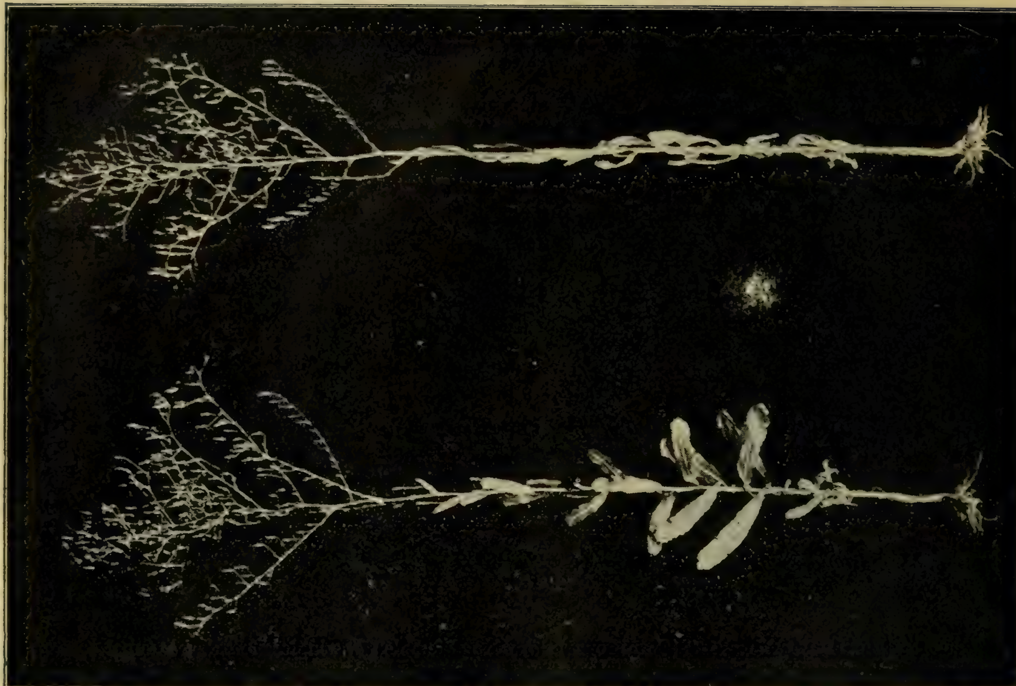


Fig. 5. Two views of *Lactuca Scariola* of the usual form, showing the compass-like habit of the leaves. To the left a view from the east (or west) side, as the plant grew, to the right a view from the north (or south) side of the same plant.

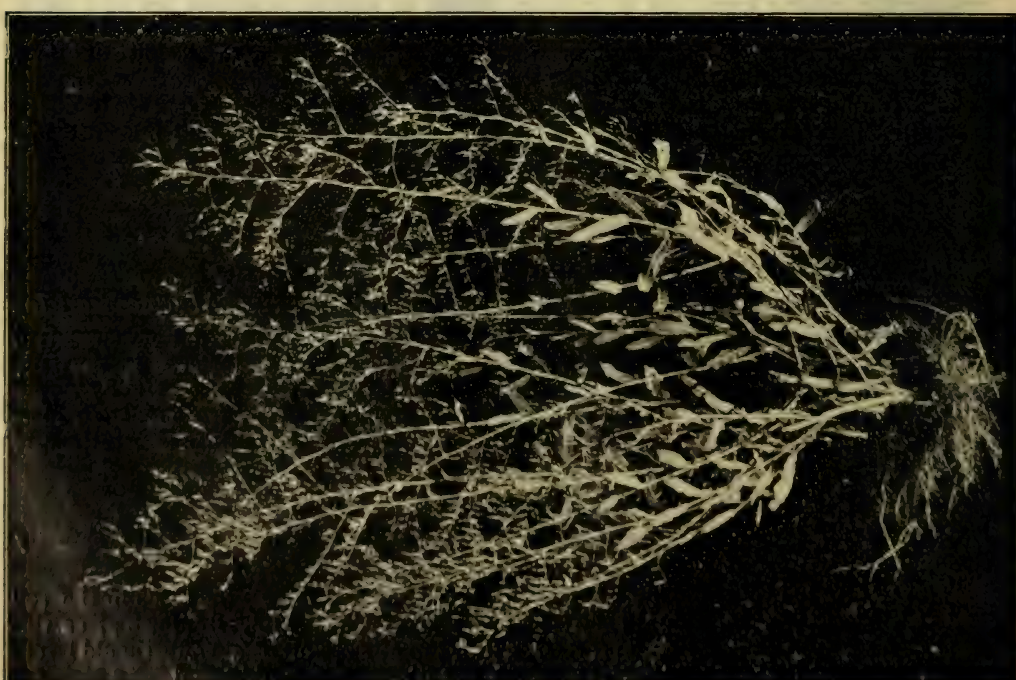


Fig. 6. A plant of *Lactuca Scariola*, which had been mowed off. It is readily seen by comparing with Fig. 5 that the branches have started from the base of the stem as a result of the mowing.

The plant may be recognized from figures 5 and 6. The leaves are clasping; the heads are numerous in an open panicle; the rays of the flowers are yellow; and the pappus is white.

(2) THE BROAD LEAVED GUM PLANT (*Grindelia squarrosa*), Fig. 7, has appeared in one or two places in Ontario. It is a native of the western plains from Manitoba to Mexico. The plant resembles a wild sunflower, but it is very gummy and sticky. The heads are yellow and nearly an inch across. It is propagated by its roots and seeds; and as it is a perennial it must be dealt with accordingly. The plants should be prevented from seeding by mowing repeatedly. When the weed becomes a pest all lands not in grass should be gang-plowed quite shallow after harvest, and cultivated as often as necessary in the fall to keep the weeds down. A hoed crop the following season should destroy most of the gum-plants and any annuals that are near the surface.

FIG. 7. Broad-Leaved Gum Plant (*Grindelia Squarrosa*), a plant which had been mowed off at *a*. The branches have started from the base as a result of mowing off. (Original).

THE NEEDS OF THE DEPARTMENT.

This department is laboring under several serious disadvantages, some of which I outlined in a previous section of this report. Briefly, the needs of this department are:

1. A larger laboratory for the first and second year students.

2. More time for practical work in entomology, geology, and zoology. In the case of the first year, one afternoon every week during the winter term should be devoted to practical exercises in zoology and geology.

3. Better facilities for museum studies. The museum is too far removed from the class-room and laboratory to be of much practical value.

4. An insectary for the study of the life-histories of insects. Where the department is doing the work of an experiment station a good serviceable building of this kind becomes an absolute necessity.

5. A special laboratory for practical exercises and investigations in physiological botany.

6. A class-room for our own use. At present the lectures to the third year are given in the bacteriological lecture room, for the reason that the biological lecture-room is occupied by a class in horticulture.

In conclusion, I wish to place on record my appreciation of the valuable services not only of my assistant, Mr. M. W. Doherty, who has shown himself to be a willing worker, a good botanist, and a capable instructor, but also of Mr. D. H. Russell, a student of the first year, whose artistic abilities have enabled me to illustrate quite fully the San José Scale bulletin, and other articles in the annual reports; and of Mr. Norman Ross, B.S.A., whose skill as an illustrator is well and favorably known at the Ontario Agricultural College.

All of which is respectfully submitted.

WILLIAM LOCHHEAD,
Professor of Biology and Geology.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, December 30th, 1899.

PART V.

PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College :

SIR,— In submitting my report for the year 1899, I beg to express to you my pleasure with the condition of the Chemical Department upon my return from Germany in December, 1898. During my absence of some twenty months the work of my department, under the direction of Mr. Robt. Harcourt, assistant chemist, appears to have been well done.

I have pleasure in submitting to you in this report (1) a brief statement of a new method of ash determination; (2) grain experiments, in which oats, barley, wheat and peas were grown in soil receiving moisture through surface application, and through capillarity from below; (3) analysis of sugar beets. My report also contains a valuable article from Mr. Harcourt, entitled "The Value of Gluten in Flour."

THE VALUE OF GLUTEN IN FLOUR.

The cereal grains and the preparations made therefrom form the most important part of human nutrition. Among all civilized nations, bread, in the broad sense, is the basis of human nutrition. Not only is it the most important, but at the same time it is the cheapest, for, measured by its nutritive value, there is no food so nearly a complete ration that, in economy, can be compared with bread. In it are found the proteids which go to the formation of flesh; the carbohydrates, of which starch is the most important; the fats and oils, which go to produce fat, heat and mechanical energy; and the phosphoric acid, lime, potash, and other mineral constituents which are necessary for the formation of bone. There is no tissue of the body which cannot be nourished by bread, especially if it be made from the whole wheat flour.

"There are many substances from which the material for bread-making may be obtained. Wheat, corn, rye, barley, oats, buckwheat and potatoes have all been used for making bread. In fact, nearly every plant furnishing a product rich in starch has been used for this purpose. The two constituents which are found in largest quantities in the cereals are the starches and proteids, the former averaging about 60 to 70 per cent. and the latter 9 to 12 per cent. So far as is known, the starches are chemically identical, and all may be detected by the same chemical action. The starch kernels, however, differ in size and shape and in their action towards ferments. The character, composition, and even the number of proteids contained in the different cereals is not thoroughly understood; but it is known that, owing to a peculiar property of the proteids of wheat flour, which it has in common with rye flour, it forms a dough when mixed with water, which, on leavening and baking, produces a light porous bread. This property of these flours is due to a difference in the composition of the proteids of the grains. They contain what is commonly known as gluten, a substance with which many of us are familiar in the form of a gum made by chewing wheat. The gluten from different varieties of wheat or from different parts of the same wheat may be very different in quality, some being firm and elastic, others soft and sticky. It is because of this gluten in wheat flour that when it is wet a dough is formed, and that when the dough is impregnated with a ferment or any gas-producing substance, the dough rises. The height to which the dough will rise depends largely on its ability to retain the escaping gases,

or upon the toughness and elasticity of the dough, which in turn depends upon the quantity and quality of the gluten. It will thus be seen that the gluten content of a flour has a great deal to do with the quality of the bread.

A commercial examination of a flour takes into account three things, namely, strength, yield and color. Flavor is so much affected by the modes of working the flour that it can hardly be considered in speaking of the commercial value. The *strength* largely depends upon the quantity and quality of the gluten, the *yield* of bread depends principally upon the amount of water the gluten will absorb, while the *color** of the flour is affected by the wheat from which it is made, by the amount of bran left in the flour, and by the amount of germ that escapes separation. It is evident, then, that the value of a flour, apart from the color, depends almost entirely upon the gluten it contains. In view of the immense amount of flour used, it is surprising that so little study has been given to the subject of flour in its relation to bread-making. During the past year we have done some work in determining the gluten content and bread-yielding power of a few of our Ontario varieties of fall wheat, and while no definite conclusions have been reached regarding comparative values, it is quite apparent that quality in gluten is almost, if not altogether, as important as quantity.

Climate and soil have a great influence on the character of wheat; apparently there is as great a difference in the strength of flour made from the same variety of wheat grown in favorable and unfavorable seasons as in the strength of samples from different varieties of wheat, while change of soil may almost entirely change the nature of the wheat. A fertile soil and a comparatively short season of growth are the most favorable to the production of a wheat with the highest and best quality of gluten. A long-growing season is favorable to the production of a large, plump grain, rich in starch. A short, quick-growing season forces the crop on the side of gluten formation, as less time is given to the filling out of the kernel with starch. It is, no doubt, true that the way the plants have wintered also affects the gluten content. When it is remembered that environment, as climate and soil, may force the wheat crop to produce starchy or glutinous seeds, that the stage of ripeness, the quality of gluten, and the ferment bodies, all give character to the grain; and, also, that when the wheat is milled a mechanical separation of the protieds takes place, it is evident that there are a great many factors which go to determine the character of the wheat and the quality of the flour. This is no doubt the cause of the differences of opinion among millers as to what wheats should be grown. Not long ago a prominent Ontario miller said that farmers should grow the varieties of wheat which would give the largest yield and the proper color, and pay no attention to the gluten content. At the same time, another equally prominent miller declared that unless farmers would grow wheats rich in gluten, irrespective of yield, the milling business in Ontario would be ruined. There is the same difference of opinion regarding the appearance of the best wheats for flour. Some millers prefer the gluey-looking, opaque kernels; others, the fine, white, transparent grains. Practically so little is known with any degree of certainity that there is here a wide field for the investigator.

Millers are complaining that Ontario wheat does not make so strong a flour as it formerly did. The same complaint is now being heard regarding the wheat from Manitoba and the North-West Territories. It is also not uncommon to hear farmers remark that their flour does not make so good bread as it did a number of years ago. At the same time, while certain varieties of wheat are spoken of as deteriorating, it is claimed that some of our soft winter varieties are improving in the quality of gluten. An effort is being made to study the change in the gluten content of wheats grown on newly broken ground and on ground that has been cropped for a number of years, to see whether the difference is one of quality, or quantity, or both; also to see if there is any possibility of of preventing the deterioration.

R. HARCOURT.

*The market at present demands a flour that will make a white, porous bread, irrespective of nutritive value or gluten content. This demand is so pronounced that a wheat which makes a dark flour, no matter how rich it may be in gluten, cannot be used for bread making. The Wild Goose wheat is a good example of such wheats.

A New Method of Ash Determination.

It is important to the science of agriculture to be able to make an accurate determination of the percentage of ash contained in plants, grasses, grain, and other agricultural products. The ash contains the lime, potash, phosphoric acid, etc., collected as plant food from the soil by the growing plant. How much ash each different kind of crop takes out of the soil, and what quantities of the various constituents are contained in this ash are questions closely related to soil fertility and soil exhaustion, which can be answered only by an accurate ash determination and analysis.

A quantitative determination of ash percentages is difficult to make, and errors which careful chemists find difficulty in avoiding, are easily introduced. The high percentage of carbon contained in the above products, the difficulty experienced in burning off all the carbon, the tendency of certain constituents to volatilize and of the ash to fuse, are the principal causes of this difficulty.

The usual method practised consists in incinerating an accurately weighed sample in an open platinum dish which has been previously weighed. The increase in the weight of the dish due to the ash which it contains, after the incineration of the substance, represents the crude ash. The percentage which this weight of ash forms of the weight of the weight of the original substance can be readily calculated. But ash thus prepared may not contain all the phosphoric acid and potash of the original substance from which the ash was obtained. It also contains more or less carbonic acid, unburned carbon and foreign matter (sand, &c.), none of which form part of the ash of the plant. Owing to the presence in the ash of one or more of the above-named substances, viz., carbonic acid, carbon and sand, it is called crude ash. Too frequently percentages of ash are reported as crude which may be more than the real ash of the substance incinerated. To these sources of error may be added the previously mentioned tendency of certain constituents to volatilize, the absorption of moisture from the air during weighing, and the formation in the ash, during incineration, of silicates, which substances seriously interfere with the analysis of the ash.

To obtain a method giving accurate ash percentages and analysis, I conducted an extensive series of analyses of natural products (straw, hay, grain, &c.) and artificial silicates. In these analyses attention was given first to the determination of the percentage of crude ash in a sample of oat straw by the ordinary method of incinerating the dried material in an open platinum dish. During the process, different degrees of heat were employed with different samples. Those samples receiving the highest heat yielded the lowest percentages of ash, and those gently heated yielded the highest. But the ash prepared by the high heat yielded high percentages of silica and low percentages of potash, while ash prepared by the low heat yielded high percentages of potash and low percentages of silica. An analysis of the silica separated from the highly heated ash showed that it (the silica) contained portions of the other ash constituents, viz., lime, magnesium, potash, &c. This circumstance led me to prepare mixtures of pure silica, potassium, carbonates, and calcium carbonates of known quantities, which, after moistening with nitric acid and drying, were subjected to different degrees of heat corresponding to the conditions in regular ash determinations by the ordinary method. An analysis of these mixtures, after heating, gave results quite similar to the results of the analyses of the above samples of ash prepared from oat straw, *i. e.*, the highly heated mixture yielded high percentages of silica, owing to the lime and potash of the mixture uniting with the silica and forming silicates, which are indecomposable in hydrochloric acid.

After trying numerous substances, I found that the addition of a solution of acetate of lime to the dry substance prevented the formation of indecomposable silicates during incineration at any temperature. The formation of indecomposable silicates being prevented by the use of the acetate, ash can be prepared which is quite decomposable in hydrochloric acid; and, consequently, accurate silica determinations can be made.

The loss of chlorides in incineration by the ordinary method has for many years been known, and numerous devices to prevent the loss have been proposed by chemists. While the quantity volatilized has been, by certain precautions, considerably lessened, its entire prevention has never been accomplished in the ordinary method of ash determination. A careful study of this source of error, viz., volatilization of chlorides, led me to design a special form of apparatus (see Fig. 1.) composed of platinum and provided with lids, cylinders and open-

ings in which the material moistened with acetate of lime solution and dried can be completely incinerated without the slightest loss of chlorides.

It is difficult to weigh fresh ash without alteration of its weight due to absorption of moisture from the air. This source of error in ash determination is entirely obviated by the freshly incinerated ash being weighed within my closed ash apparatus.

By removing certain parts of the apparatus, Fig. 1., it may be immediately connected after weighing with drying tubes and potash bulbs, as in Fig. 2., for the determination of carbonic acid in the ash, without the removal of the ash to a special carbonic acid apparatus.

Sample carefully and grind the steam-dried material to a uniform powder, which may be preserved in a tightly stopped bottle.

Two to three grains of this prepared and bottled sample are weighed for a moisture determination.

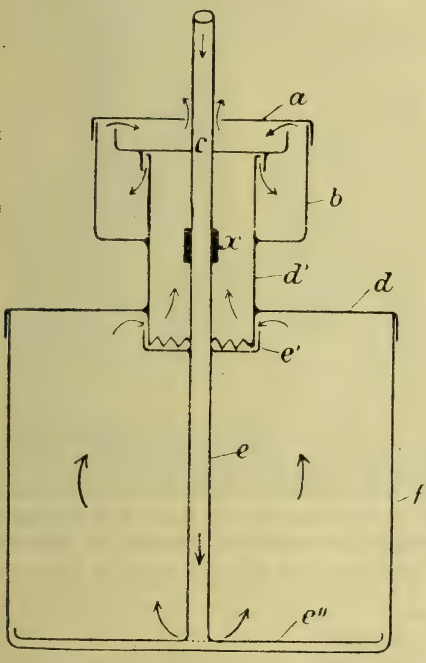


FIG. 1.

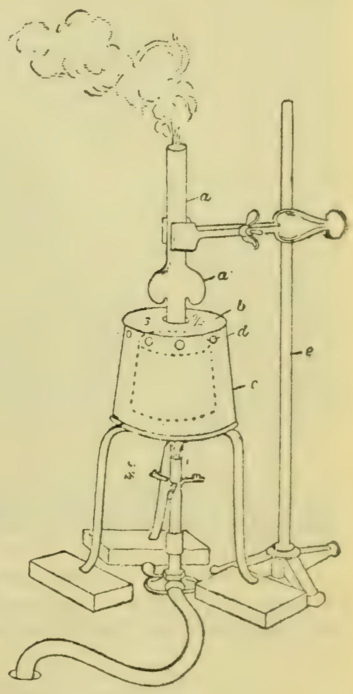


FIG. 2.

Ten to fifteen grains are next weighed into the previously weighed ash apparatus, Fig. 1, and moistened with twenty or more cubic centimeters of calcium acetate solution. The deep dish, or principal part of the apparatus which contains the weighed and moistened sample, is fitted into the charring oven, Fig. 2, where the sample is first dried and then charred to a gray ash at a very low heat. The drying and charring should not require more than three hours. The other parts of the ash apparatus are now carefully fitted together, enclosing the gray ash which, as in Fig. 3, is incinerated to a white or grayish white ash. The apparatus containing the ash after cooling is again weighed, to obtain by difference the weight of the enclosed crude ash. Leaving the ash in dish, certain parts of the apparatus are cleaned of adhering ash and laid aside while the dish containing the ash is connected, as in Fig. 4, with the drying tubes and potash bulbs for a carbonic acid determination. The dish containing the dissolved ash and separated silica is again placed in the charring oven, Fig. 2, where the ash in the presence of hydrochloric acid is evaporated to dryness. After taking up with concentrated hydrochloric acid, warming, and diluting, the silica is collected upon a Gooch crucible, dried and weighed. The filtrate containing the other constituents of the ash is analysed in the usual way. The crude ash minus the carbonic acid equals the carbon-free ash.

GRAIN EXPERIMENT:—SURFACE AND SUBSOIL OR UNDERGROUND MOISTURE.

Early in May last, a cart load or two of surface soil from a farm field where roots were grown the previous year, was thoroughly mixed to be used in a grain experiment. Ten cylinders of galvanized iron, 12 inches in diameter and 3 feet long, were placed in two rows upon the ground, and filled with the soil mentioned above, each containing practically the same weight of exactly the same soil. These cylinders

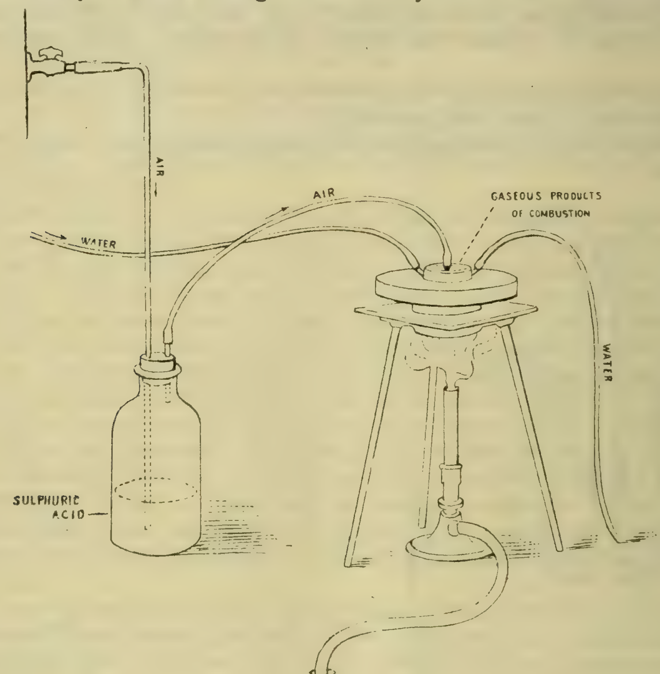


FIG. 3.

contained bottoms constructed for retaining water which through little holes could enter the cylinder, moistening the soil. A cotton sheet containing circular holes was stretched over the cylinders in such a manner as to expose only the surface of the soil to the sun. A cotton roof was also provided, which being pulled down over a frame entirely protected the plants and soil during storms.

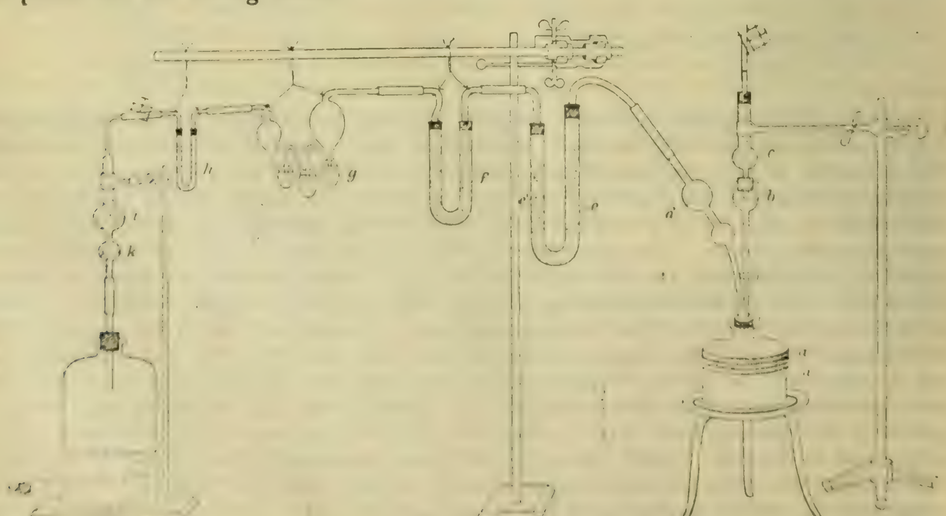


FIG. 4.

Fig. 5 illustrates the experiment on the 3rd of August, when the grain was beginning to ripen.

Cylinders marked 1, in Fig. 5, contain oats; those marked 2, barley; those marked 3, wheat; and those marked 4, peas. There are, therefore, two of each kind. In every instance, the cylinders to the left, facing the experiment at the end by 1, are supplied with water at the bottom, while those to the right are watered at the top. The surface, or top-watering, represented rain and was repeated whenever the soil appeared dry, while the bottom-watering represented an abundant supply of ground-water. No manures were used. All grains were sown on May the 8th, when the soil was nicely settled and moist. The young plants began to appear above ground in four to five days, that of the surface-watered soil appearing from twenty to thirty hours before that of the bottom-watered soil.

Fig. 5. (1) Oats, (2) Barley, (3) Wheat, (4) Peas.

The surface-watered oats, between the date of sowing, May 8th, and harvesting, August 26th, required watering 46 times, taking in all 43 lbs. of water; while, during the same period, $65\frac{1}{4}$ lbs. of water entered the soil in the other cylinder growing oats. The surface-watered barley, wheat, and peas required respectively $38\frac{1}{2}$ lbs, $29\frac{3}{4}$ lbs., and 28 lbs.,—while the bottom-watered required, respectively, $25\frac{1}{2}$ lbs, $34\frac{1}{4}$ lbs., and 104 lbs. of water. It was only in the case of the barley that the amount of water applied upon the surface exceeded the amount taken up at the bottom. In these latter kinds, as with the oats, surface watering had to be frequent, to prevent parching. Barley, having a comparatively shallow growing root, cannot draw upon the deeper soil moisture so well as oats, wheat, or peas; and this no doubt, accounts for barley suffering quickly in dry spells.

Surface and Ground Moisture in the Growth of Oats.

On August the 20th, the oats in cylinder 1 (a) were ripe, while those in 1 (b) were four days later in ripening. Fig. 6 shows that (a), the surface-watered oats, has produced less growth of straw than (b), the bottom-watered; but (b) shows a lighter root-growth than (a), which is in reality not the case. In removing the soil from the roots without breaking the rootlets, greater difficulty was experienced in these soils which had been watered from below. The total growth, in the case of (a), amounted to 67.66 grams, composed of roots, 10.63 grams; straw, 45.13 grams; and grain, 11.9 grams; while (b) amounted to 82.39 grams, composed of roots, 7.96 grams; straw, 56.93 grams; and grain, 17.5 grams.

Surface and Ground Moisture in the Growth of Barley.

There was little difference in the growth, maturity, and yield between the surface and ground-watered barley. (a), surface, and (b), ground-watered barley are shown before harvesting in Fig. 5, and after harvesting in Fig 7. The roots of barley (a) in Fig. 7, owing to an attempt to wash them free from earth, appear much less than they

(b) Fig. 6. (a)

are. The total yield of roots, straw, and grain, amounts in (a), surface-watered, to 45.39 grams; and in (b), ground-watered, to 45.34 grams. This experiment with barley shows the importance of the preparation of a seed-bed for barley, which supplies moisture in the surface soil, where the roots develop. Hence a spring-plowed soil cannot be expected to produce the best results in barley growing.

SURFACE AND GROUND MOISTURE IN THE GROWTH OF WHEAT.

It will be seen by reference to (b) and (a) of 3 in Fig. 5, and to (b) and (a) in Fig. 8, that the surface watered soil has grown a somewhat shorter but better headed crop than the other soil. The total weight of growth (roots, straw, and grain) is 29.95 grams on the former, and 26.62 grams on the latter soil. But while the sum of the straw and grain in (a), the surface watered crop, is 27.4 grams, and that in (b) is 23.5 grams, the roots of (b) are slightly heavier and better developed than (a). It is quite probable that the yield of crop on the ground-moistened soil, with a somewhat greater root growth, would have been greater than that on the surface-watered soil had not the blight injured the former, which matured more slowly, considerably more than the latter.

(*b*) FIG. 7. (*a*)

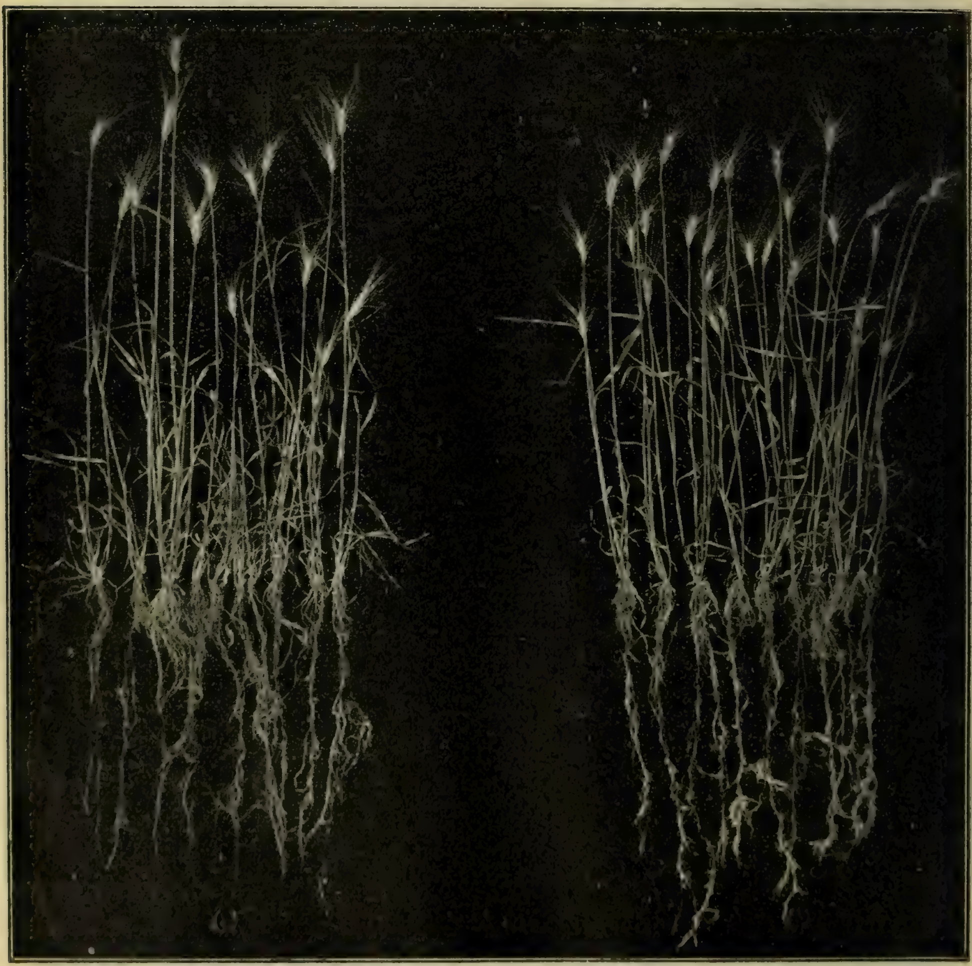
SURFACE AND GROUND MOISTURE IN THE GROWTH OF PEAS.

It is quite evident that the pea crop marked (b) in Fig. 9 and 4 (b), Fig. 5, is decidedly stronger and heavier than the other pea crop in the same Figs., which grew in the surface-moistened soil. The latter crop matured on the 15th of August and the former on the 22nd of the same month. The surface-watered soil yielded a total crop of 63.32 grams, consisting of straw, 39.05 grams; grain, 21.30 grams; and roots, 2.97 grams, while the soil moistened from below yielded a total crop of 116.6 grams, consisting of straw, 73.0 grams; grain, 38.5 grams; and roots, 5.1 grams.

It may be remarked that owing to the very little rain which fell during the period of this experiment the atmosphere for days in succession was dry and parching; and had it not been for frequent watering of the surface soil the crops supplied with moisture in this way would have suffered badly—the natural watering by rain would not have sustained anything like a satisfactory growth. If the soil can supply sufficient moisture for

the crop's requirement its growth becomes, to a great extent, independent of summer rains. Humus in soil greatly increases its power to retain moisture, and cultivation of the right kind and at the right time contributes greatly towards the retention of moisture and aids in its movement through soil for the use of the crop.

The analysis of the grain and straw grown in this experiment is under way for the purpose of ascertaining the total quantity of the several ash constituents and nitrogen in each kind of grain, with their distribution between the straw and the grain.



(*b*) FIG. 8. (*a*)

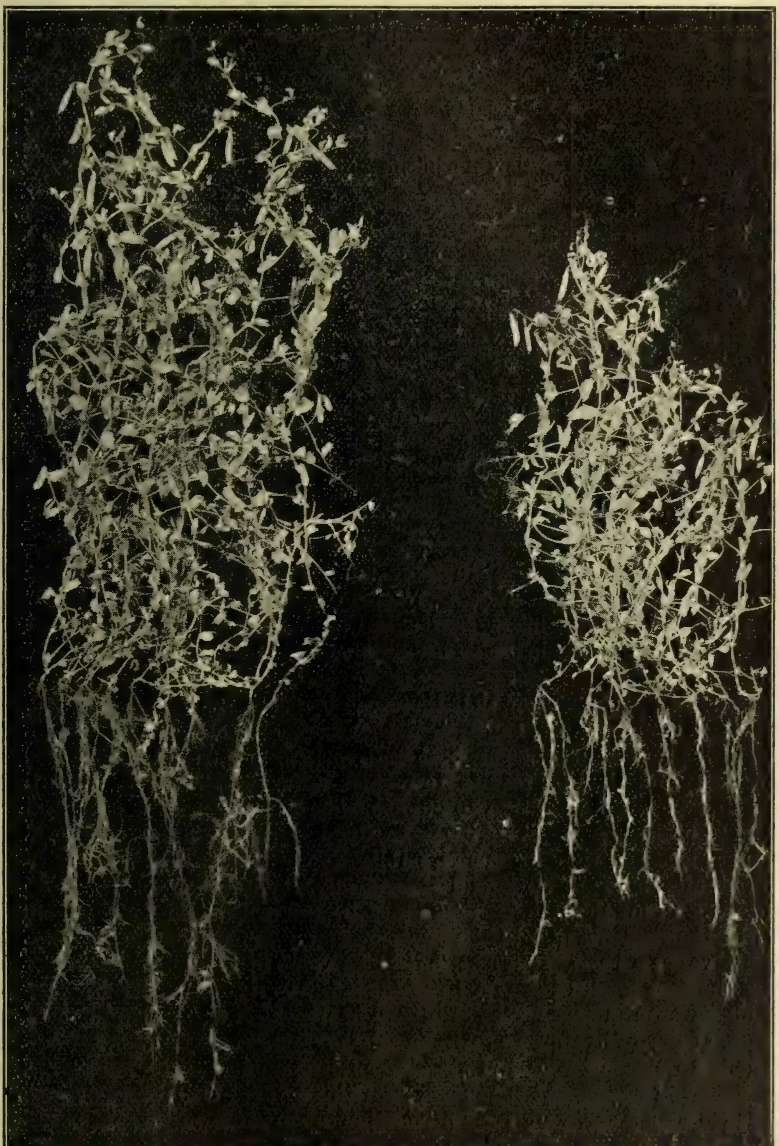
SUGAR BEET ANALYSIS.

Mr. Robert H. Lawder (now deceased) in a letter dated January 11th, 1899, wrote me to the effect that Mr. William James Stewart, Glasgow, Scotland, who represents a Scottish sugar syndicate, spent the winter of 1887-8 in the United States and Canada enquiring into the prospects for the profitable investment of capital in beet sugar factories. Further, that the above gentleman, having returned to Scotland, was at that time in correspondence with him (Mr. Lawder) in reference to Ontario as a suitable place for sugar factories.

Nothing more regarding this matter was heard until October last, when a communication from the Department of Agriculture, Toronto, requested me to make an analysis of beets which were then being forwarded from Aylmer, Ont.

A few days later, the above gentleman, Mr. William James Stewart, arrived at the Ontario Agricultural College to enquire into the results of the analysis of Aylmer sugar beets, and to arrange with us to have analyses made of other samples of sugar beets that would soon be forwarded from Aylmer, Dunnville and Wiarton.

In consultation with you, it was decided to comply with Mr. Stewart's request to analyse the beets, provided express charges were prepaid. In all, ninety-two samples of



(*b*) FIG. 9. (*a*)

sugar beets were received and analysed in our laboratory between October 25th and November 14th. Fifty-seven samples were received from Dunnville, twenty-two from Aylmer, and the remaining samples chiefly from Wiarton.

To obtain beets that yield profitable quantities of sugar, the roots must mature or ripen sufficiently before they are pulled. To grow such roots special attention must be

given to manuring, cultivation, thinning, etc. As a rule, the Canadian farmer manures, cultivates, etc., to obtain a big yield of roots, regardless of the proper degree of maturity for a high yield of sugar. It can be well understood that, owing to the influence of maturity upon sugar content, where little or no attention is given to the maturity of the beet, there would be grown good, bad and medium beets from a sugar standpoint. Such samples were received in our laboratory ; consequently the averages cannot be so high as might reasonably be expected from proper and uniform cultivation.

In the following table averages are given of all samples pulled upon certain dates. These averages show better results, as a rule, in the samples of the later than in those of the earlier dates.

Place and lot.	Date of pulling.	Number of samples.	Average weight of roots.	Analysis of juice.		
				Solids.	Sugar.	Purity.
			lbs.			
Dunnville.						
First	Oct. 25th	1	1.35	16.34	12 8	79.2
Second	Nov. 1st	29	1.75	15.71	12.08	75.0
Third	Nov. 18th	8	1.71	18.25	14.50	78.4
Fourth	Nov. 22nd	10	1.35	18.60	15.03	80.8
Fifth	Nov. 27th	9	1.73	17.17	14.20	82.5
Aylmer.						
First	Oct. 24th	6	....	16.06	11.90	74 1
Second	Oct. 26th	5	1.80	16.54	12.44	74.8
Third	Nov. 14th	11	1.08	18.20	15.00	82.1
Wiarton.						
One lot	Oct. 30th	10	....	16.78	13.31	80.1

The above averages show that the November beets are better from a sugar standpoint than the October-pulled roots. Wiarton roots of October 30th are fairly good. The fourth lot of Dunnville beets were somewhat wilted when received. Mr. Stewart expressed himself quite satisfied with beets yielding 14 per cent. sugar in juice with purity 80.

It appears to me quite clear that there can be grown in Ontario sugar beets containing satisfactory quantities of sugar, and that several sections have soil, climate, and natural facilities suitable for sugar beet cultivation for factory purposes. However, it will be necessary, for the best results, to furnish growers with clear and full directions as to cultivation. It is my intention to publish such directions should there be a prospect of one or more beet sugar factories being established. This, however, does not appear to be the proper place and time for such a publication.

In concluding my report I would respectfully remind you of the vastly increased amount of work in my department occasioned by the method of teaching by laboratory work, *i.e.*, by the students of all the years performing experiments and doing laboratory work themselves as a basis of instruction. The value of this method is recognized and adopted by the best institutions. I have not found in any of the European institutions for the study of natural science that the staff of professors are so hampered and harassed through lack of demonstrators to assist in this practical method of teaching as we are in this College. In my last report, I asked for the appointment of a fellow in my department, but received none. At the opening of this present College year, seeing my situation, I engaged assistance, with your permission, upon my own responsibility rather than abandon what is known to be the best method of teaching natural science, hoping that the pressing necessity for a fellow would be recognized before long.

WORK AT PRESENT UNDER WAY.

It has always been difficult in this department, where results cannot be obtained rapidly, to complete investigations at a fixed or set time. There must necessarily be work under way, which, not being completed, cannot appear in the report.

We have at this date several important investigations that cannot be finished for this report. Of these, the most important are: (*a*) digestion work, to ascertain the relative composition and digestibility of nearly matured and freshly cut fodder corn, cut at the same time and cured, in the silo, in the barn, and in the field; (*b*) an investigation into the quantity and quality of gluten in different varieties of wheat, together with their bread-producing capabilities to see what extent the quantity and the quality of the gluten are related to the deteriorating strength noticeable in flour; and (*c*) the total ash constituents that the various staple crops remove from soil and the distribution of these several constituents in the grain and straw.

It will not be forgotten that each department in an institution of this kind has, at all times, a fairly heavy correspondence and numerous requests by farmers and others to analyize, examine, and identify samples and specimens of various kinds. This is a sort of work which, we know, must not be neglected nor delayed. My assistant, Mr. Harcourt, has this entire time more than occupied in the station laboratory with the analysis of miscellaneous substances received from farmers and others, and with a large part of the analyses belonging to the investigation work; while I find it quite impossible to handle alone, with any degree of justice to our students, our large classes, two of which, upon two days in the week, are present at the same time.

Finally permit me to express my appreciation of the valuable services rendered to this department by my assistant, Mr. Robert Harcourt, and to acknowledge the services of Mr. Wm. P. Gamble, who has cheerfully and gratuitously aided in what would otherwise have been an impossible task.

Respectfully submittted,

A. E. SHUTTLEWORTH,
Professor of Chemistry.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, December 30th, 1899.

PART VI.

PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College:

SIR,—I beg herewith to submit my report for 1899.

CLASS-ROOM.

First Year—To the first year students I delivered a course of lectures on comparative anatomy, paying particular attention to the anatomy of the horse, and where important differences exist between the horse and the ox, drawing the attention of the class thereto. In this course, I aim at giving the students an intelligent idea of the general anatomy of domesticated animals, as regards bones, joints, ligaments, muscles, tendons, the digestive, respiratory, urinary, and genital systems; also the circulatory and absorbent systems, the skin, foot, and organs of special sense. I endeavor to make the points as simple and plain as possible, and use for illustration the skeleton of a horse, a living horse, specimens, and charts. I also gave a course of lectures called "Practical Stable", in which we discussed the proper kind of stables to build, in respect to site, size, material, ventilation, drainage, kinds and sizes of stalls, mangers, &c; the general care of horses, as regards food, water, work, grooming, care of feet, shoeing, &c., care of harness, saddles, &c., &c. Also a course of lectures on judging horses, in which I selected two or more individuals of the class of horses under discussion, mentioned the points as regards conformation, action and manners of a typical animal of the class, and then compared the animals present with the ideal. I impressed upon the class the general principles upon which a man acting as judge of horses should proceed in order to do justice to himself, the institution from which he graduated, the exhibitors, and the society for which he is acting.

To this class also I gave a course of lectures on veterinary *materia medica*, in which I spoke of the general actions of medicines, the properties, actions, uses and doses of the different drugs and remedies used for the prevention and cure of the ordinary diseases of farm stock.

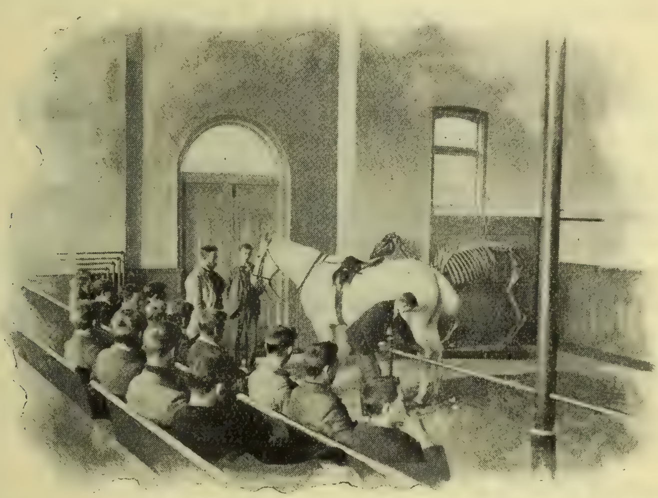
Second Year.—To this class I delivered a course of lectures upon Veterinary diseases and treatment, mentioning the causes, symptoms and treatment of the ordinary diseases to which farm stock is subject, paying special attention to preventive measures. During the spring term I gave a course of lectures upon Veterinary Obstetrics, speaking of the general hygienic treatment of breeding animals, both before, during and after pregnancy; the means and precautions to be observed to prevent disease or accident and the symptoms and treatment of such as are liable to occur; the care of the young animal before and after weaning, &c., &c. I also gave a course of lectures and illustrations upon a subject we call "Practical Horse", in which I explained the desirable points of the different classes of horses, the means of detecting disease and blemishes in horses; the modes of securing horses for the performance of simple operations, such as dressing and stitching wounds, opening abscesses, dressing teeth, and bandaging; the different modes of administering medicines, with the precautions to be observed; dressing the feet, &c. In all my lectures to both classes my aim is to make everything as simple and practical as possible, avoiding technicality.

To the special dairy class I gave a short course of lectures upon the causes, prevention, symptoms and treatment of the ordinary diseases to which dairy stock is subject.

Besides class room work, I gave professional attention to the farm, dairy and experimental stock; and while we have had considerable sickness, and some very severe cases, I am pleased to be able to state that the losses have been few. Below will be seen particulars of the diseases which occurred in the different kinds of stock during the year.

Horses.—We had a few cases of acute indigestion, colic, influenza, lymphangitis, sprains, &c., all of which yielded to treatment. We had one case of leuchorrœ in a mare, which also yielded to treatment; and one of the experimental horses developed a ringbone, which caused lameness. I fired with a hot iron and blistered, and the lameness disappeared.

Cattle.—We had three cases of parturient apoplexy (milk fever) in cows, all of which made perfect recoveries. We had one fatal case of pneumonia in a farm cow. The farm herd became affected with infectious ophthalmia, that serious and common disease of the eyes to which cattle have been subject for five or six years. We used the following mode of treatment with perfect success :—We isolated the affected animals as far as possible, protected them from the sun and wind, and excluded all draughts ; we also gave each animal a slight purgative, consisting of a pound of Epsom salts dissolved in warm water, and put a few drops of the following lotion into the eyes twice daily : Sulphate of zinc, 10 grs ; fluid extract of belladonna, 15 drops, and water, 2 oz. In a few cases an ulcer formed and burst, in which cases I touched the parts carefully, once daily for a few days, with a pencil of nitrate of silver. In every case a thorough recovery resulted. We had several cases of inflammation of the udder, sore teats, impaction of the rumen, retention of the placenta, fardel-bound, a few cases of lameness, &c., all of which recovered. I dehorned several feeding steers, and both Mr. Rennie and Prof. Day have arrived at the conclusion that they are more gentle and feed better after the operation.



PRACTICAL HORSE—VETERINARY DEP'T.

Sheep.—We had three fatal cases of grub in the head. One ewe died during parturition. A ram got his leg fractured and as he was in good flesh we decided that it would be more profitable to butcher than to treat him. We lost two or three lambs from wool ball in the fourth stomach. The lambs became affected with tape-worm, as usual, and we treated them as follows : We made a mixture of one part oil of turpentine and sixteen parts sweet milk, starved the lambs for 10 or twelve hours and administered to each from 2 to 4 oz. of the mixture, according to age and size, and after ten days we repeated dose. We had no actual losses, but the lambs did not do so well as they otherwise would have done. A few of the ewes were worried by dogs, and as a result one of them died,

Swine.—We had very little trouble with the swine and no fatalities, except in newly born pigs.

I have, Sir, the honor to be,
Your obedient servant,

J. H. REED.
Professor of Veterinary Science.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, Dec., 19th, 1899.

PART VII.

PROFESSOR OF DAIRY HUSBANDRY.

To the President of the Ontario Agricultural College:

Dear Sir,—I beg leave to submit my ninth annual report of the Dairy department. I wish to acknowledge assistance given by the Farm, Chemical and Bacteriological departments during the year. Mr. Rogers, instructor and experimenter in the butter section of the department, resigned on May 1st. Miss Bella Miller and Miss Alice Squirrell, graduates of the Dairy School, were placed in charge during the summer, and did the work in a very satisfactory manner. Mr. Stratton has done excellent work in the cheese section. He has also acted as butter instructor for the regular college students and for the special creamery course in the month of December.

Mr. Jas. A. McFeeters, graduate of the dairy class of 1897, has been appointed to succeed Mr. Rogers as experimenter and instructor in the butter section.

THE DAIRY SCHOOL.

The past year has been a very successful one for the Dairy School. In addition to the regular course during the months of Jannary, February and March, we have had a special creamery course in December of this year. The attendance at the regular course exceeded that of 1898, during which year there were 110 registered. In 1899, the number of students registered during the three months was 115, of whom 17 were ladies. During the creamery course in December the attendance was nineteen, including four ladies; also about 40 second year students in the regular course took this course.

Of those who attended in the early part of the year 53 registered for the full course, including cheese-making, separators, milk-testing and butter-making; 17 took special work in butter-making and milk-testing; 3 took butter-making alone; 7, cheese-making and milk-testing; 1, cheese-making; 4, milk-testing; 3, special work on general lines; and 27 took the home dairy course. It will thus be seen that our students choose quite a variety of dairy work. This, to a certain extent, hinders the work of our regular classes; hence, one reason for a special course in butter-making during December. It may also be necessary to have special classes for cheese-makers and home dairy men and women in December, to lessen the number who at times crowd the work in practical cheese and butter making during the regular term. We would prefer having for the three months' term only those who purpose taking up the full course, and would also prefer that these should all have more or less experience before coming. Inexperienced students, those staying for a short time only, and those who wish to take up work in only one department, can be best managed in small classes during a special term.

Of those registered for butter-making only, their experience ranged from 0 to 21 years. The cheese men's experience was 0 to 16 years. It is difficult to map out work suitable for such, at one and the same time.

We had considerable difficulty in securing a supply of milk suitable for our work. As Guelph and the vicinity is not a dairy section, we shall, I presume, always meet this difficulty.

On the final examinations at the close of the term 44 wrote for certificates, of whom 5 were specialists in butter-making, 2 in cheese-making, and 2 in home dairy work. All passed, but certificates were with held from a number owing to lack of experience.

It is gratifying to know that a number each year send in the monthly reports for professional diplomas. Those applying this year are: J. W. Newman, Roebuck, Ont. (cheese); John McCready, West Lima, Wis. (cheese); T. B. Oode, North Rideau, Ont (cheese); Harvey Mitchell, Sussex, N. B. (butter); S. J. Taylor, Regina, N. W. T (butter).

Most of our students came from the Province of Ontario. There was one student each from the following Provinces, States, and countries: Quebec, Manitoba, British

Columbia, Pennsylvania, U.S.A., Scotland and England. We had demand for more students as makers and helpers last spring than we could supply. So far as we know, all who were capable of working in creameries or cheese factories secured places at the close of the term or shortly after.

To the Instructors in the Dairy School and the Lecturers from the College, I am indebted for their efficient work during the term.

Care of Milk for Cheese-making.

There is a diversity of *opinion* as to the best methods of caring for milk to be manufactured into cheese, and but few *accurate experiments* have been made to discover what is really the best plan. During July, August and September, some 40 experiments were made by treating the milk from our own herd in different ways in order to gain some definite knowledge on the subject. Most cheese makers advocate aeration of the milk, and say that if the milk is properly aired, it will not require cooling. Others recommend airing and cooling, while the average patron thinks that nothing is necessary. We have found it a very complicated problem and one which will require several year's investigation in order to ascertain the effects which the cows themselves have on the milk, the effect of pasture, the effects of weather, methods of handling, etc. At present, I am inclined to think that the peculiar condition of the atmosphere at times is largely responsible for "gassy" and other flavors, assuming that cleanliness is observed. Under certain conditions the milk from our own cows is "gassy," no matter how it is handled; and this is probably true of many, if not all herds of milk cows. At certain times the growth of bad-flavored organisms is very rapid and it is difficult, with our present knowledge, to prevent them growing. Here is a field for the Dairy Bacteriologist to work in, and find out how the bad crop of germs may be best controlled.

Our experiments during the past season may be classified as follows: 1. Effect of aeration of milk at the stable, in the cow yard, and in the pasture field; 2. Effect of aeration combined with cooling by means of ice; 3. Effect of cooling without aerating; 4. Effect of milking in the stable, yard, and the pasture field; 5. Effect of rejecting the first few streams of milk from each teat; 6. Effect of aerating milk one day and not aerating the next; 7. Care of Saturday night's milk.

We shall treat them under two general headings: Effect on sweetness of milk, and on quality of curd and cheese.

At the time of the experiments, we were milking about 25 cows. Some were fresh and others were in various stages of lactation. Our herd consists of a mixed lot—some pure-bred Holsteins, Jerseys, and Ayrshires, and the remainder, grades of various breeding.

The Champion aerator was used in most of the work. A few trials were made of the Cornett aerator and agitator. The aerated lots were usually run over the aerator twice. The temperature of the air at night varied from 59° to 86°. The temperature of the air in the morning varied from 42° to 70°. The temperature of the milk at night was 90° to 96° before aerating, and 84° to 94° after aerating. The night's milk which had been aerated was 54° to 73° the following morning. The unaerated night's milk was 55° to 74° the following morning. The rennet test of the aerated milk was 21 to 29 seconds, and that of the unaerated 12 to 26 seconds the following morning. The quality of milk in each lot varied from 109 to 120 lbs. in one can. When the temperature of the air at night was 80° or above, the milk which was aerated twice over the Champion without any cooling other than that done by the atmosphere, was very ripe, or sour, the following morning. The same was true of the Cornett aerator.

When the temperature of the night air was under 80° and that of the morning air under 70°, the milk was in good condition the following morning, by aerating only. When 4 to 6 lbs. of ice were placed in a shot-gun can and the can set in the milk after aeration, or in the unaerated milk in hot weather, the milk was sweet the following morning. On Aug. 28, when the temperature of the evening air in the milk stand was 84°, and the temperature of the morning air 60°, and that of the milk 95° in the evening and 68° in the morning, a can of milk containing 152 lbs. was set in a tub of cold water and the Cornett agitator set going. The following morning the rennet test of the milk 8 seconds, or, in other words, it was nearly sour. Ten pounds of ice were put in the

water the following evening, and the rennet test was 20 seconds, which means that it was sweet.

To sum up the whole question of aerating and cooling in their effects on the ripeness of milk, these experiments indicate that aeration alone is not sufficient to keep milk sweet over night and in good condition for cheesemaking the following morning during hot weather, or when the air is above 80° at night, or not below 70° in the morning; but a very small amount of ice placed in a can and the can set into the milk will keep it all right. This is necessary only on hot nights.

For keeping the milk sweet, 4 to 6 lbs. of ice in a can, set in the milk, was more effective than aeration.

Flavor and Gas in Curd as Affected by Place of Milking and Place of Aeration.

On July 19th, the cows were milked in the yard, stable, and pasture field, and half the milk was also aerated in the yard, stable, etc., and the other half not aerated at all. Possibly the best plan to show the effects will be to give the treatment of the milk each day and the comments of our cheesemaker, Mr. Stratton.

July 19th. Cows milked in yard. High wind blowing the dust about very badly. Milk in A vat was aerated in yard; in B vat, not aerated. Both curds had an equal amount of gas. B curd had also a weedy flavor. A cheese scored 90 points, B 93, on Aug, 30th.

July 20th. Cows milked in yard. Wind did not blow. A vat aerated in yard; B not aerated. Acid slow in A. B vat very gassy. A cheese scored 88, and B 87, on Aug. 30th.

July 21st. Cows milked in yard. A vat of milk aerated in yard; B not aerated. Curds in both seemed good until heated; then they developed a very bad flavor. Cheese scored 91 and 92 on Aug. 30th. Both scored 84 points on Sept. 19th.

July 22nd. Cows all milked in pasture field, half mile from dairy buildings. Milk in A vat aerated in pasture field; B vat not aerated. A was a nice curd; B had very little gas, but a very bad flavor. B vat, washed twice at dipping time. Score of cheese on Aug. 30th—A, 93; B, 88 points. Flavor, 37 and 36 out of 40.

July 25th. Cows milked in stable. Milk all run over Champion aerator once in stable and once at dairy. Milk not divided. Curd very gassy. Cheese scored 85 points on Aug. 30th.

July 26th. Cows milked in stable, but milk carried outside and aerated once in yard. Aerated again at dairy. Rained previous day. No dust blowing. Gassy at milking time, but nice when salted. Cheese scored 93 points.

July 27th. Cows milked in stable. First six streams from each teat put into separate pails. Weight of rejected milk in evening, 12½ lbs., testing 1.5 per cent. fat. Morning milk rejected, tested 1.3 per cent. fat, and weighed 15 lbs. Milk very ripe. Curd washed with cold water after being heated to 108° before dipping. Score of cheese, 65 points.

July 28th. A vat from dairy herd. Cows milked in yard and milk aerated in yard and once at dairy. B vat of milk from patrons' regular delivery and not aerated. Both curds gassy. No starter used. Cheese scored 90 and 91 points. Both scored 36 in flavor.

July 29th. Cows milked and milk aerated in pasture field. Milk over-ripe. Curd washed with cold water after heating to 106°. After milling, curd had a "slimy" feeling and flavor not good.

Aug. 1st. Cows milked in stable and milk aerated at stable and once at the dairy. Starter used in milk. Curd slightly gassy, but after milling the gas and gassy flavor disappeared. Score of cheese, 89, on Sept. 19th.

Aug. 2nd. Cows milked in stable, but milk was aerated in yard once as milked and once at dairy after milking. Starter used. Curd gassy. Score, 89.

Aug. 3rd. Cows milked in stable, but first few streams from each teat put in a separate pail. The night's and morning's rejected milk weighed 30 lbs. and tested 1.5 and 1.3 per cent. fat. One-half a per cent. of starter used. Curd very gassy. Score of

cheese on Sept. 19th was 90 points. Messrs. Bell, Brill and Steinhoff each scored this cheese on Nov. 17th, and gave it respectively 89, 92 and 94 points.

Aug. 4th. Cows milked in yard. Milk aerated once in yard and once at the dairy. One-half a per cent, of starter used. Curd worked nicely. Best flavor and least gas of any day during the week. Score, 91 points.

Aug. 5th. Cows milked in pasture field and milk aerated in pasture field. Starter used. Curd gassy. Flavor fair. Score, 88, on Sept. 19th.

Aug, 8th. Cows milked in stable. Milk not aerated. Flavor of curd very bad. No starter. Little gas. Curd weak in body. Score, 91, on Sept. 19th.

Aug. 9th. Milk run over Champion aerator twice. No starter. Milk sweet and ripened slowly. Bad flavor at dipping time, which disappeared at salting. Curd gassy. Score of cheese, 87.

Aug. 11th. Milk aerated twice. No starter. Curd worked nicely. Some bad flavor at dipping time. Good curd at salting. Score, 90, on Sept. 19th, and it was given 83, 87 and 85 by the judges on Nov. 17th.

Aug. 12th. Milk not aerated. Milk over-ripe. Washed curd after dipping. Flavor fair. Score, 78.

These experiments were continued up to Sept. 29th. Sometimes half the milk from the dairy herd was aerated and the other half was not aerated in any way. At other times all the milk from the herd was aerated one day and left unaerated the next. There was very little difference in the curds or in the quality of the cheese, as shown by the average score of the cheese in the table. Where the milk was mixed together before aerating, and while the milk was warm, the cheese have an average total score of exactly the same, though the cheese made from the aerated milk was slightly better in flavor. Where the milk was not mixed together, but all the milk aerated one day and left unaerated the next, the average score of flavor is slightly better in the unaerated cheese, and the total score is also higher.

Average score of cheese from aerated and unaerated milk.

—	—	Average lbs. milk used.	Average per cent. fat in milk.	Average lbs. cheese per 1,000 lbs. milk.	Average flavor. (Max. 40.)	Average closeness. (Max. 15.)	Average texture. (Max. 20.)	Average total. (Max. 100.)
Milk mixed together before aerating half of it...	Aerated...	290	3.55	94.04	36.04	13.09	17.14	90.04
	Unaerated	287	3.55	93.19	35.45	13.36	17.23	90.04
Milk not mixed together..	Aerated...	....	....	....	34.18	13.07	16.78	88.11
	Unaerated	....	....	....	36.13	13.33	17.13	90.93

Conclusions.

1. Milking and ærating in the pasture field gave two very good curds and one bad curd, chiefly due to milk being over-ripe.

2. On certain days the curds were gassy, no matter where the cows were milked or how the milk was treated. A good flavored starter in the milk seems to be the best remedy for gassy and other bad flavors.

3. Rejecting the first few streams of milk from the teats of each cow did not prevent gas forming in the curd.

4. In these experiments aeration of the milk did not prove so beneficial as we expected. When the cows are healthy and are fed on clean food and are milked in a cleanly manner, in a clean place, aeration is probably of no particular advantage to milk for cheesemaking. Aeration to some extent cools milk and is thus advantageous in keeping it sweet.

5. Further experiments are needed before coming to definite conclusions.

Saturday Night's Milk.

In many cheese sections it is customary to make the milk of Saturday evening into butter or cheese during Saturday night and Sunday forenoon. This makes a slave of the cheesemaker who has practically no rest during the week.

During July and August some experiments were made to find to what temperature it was necessary to cool the milk on Saturday evening in order to have it in good condition on Monday morning.

The milk from the dairy herd was divided into two lots, and put into cans which were placed in cold water. The temperature to which the milk was cooled ranged from 46° to 64°. It will be noticed in the table that when the air in the milk-stand was 72° to 82° and the milk cooled to 62° to 64° the milk was nearly sour on Monday morning, and would in all probability be rejected at a cheese factory. A can of similar milk kept in the same place but cooled to 52° to 54° was in good condition on Monday. When the temperature of the air in the milk-house is between 70° and 85° it is necessary to cool to between 50° and 55° for good results. When the temperature of the air is between 65° and 75°, cooling the milk to 56° to 58° gave good results. During the summer it is seldom safe to hold milk until Monday at a temperature above 58° to 60°, and in hot weather it should be cooled to 50° to 55°. In these trials the milk was not aerated any more than the necessary aerating which it received by stirring it with a dipper while cooling.

On August 12th one lot of 95 lbs. was put into a can and a lot of similar milk was divided among four shot-gun cans to see the effect of keeping milk in a smaller bulk. There was no difference in the sweetness or general condition of the two lots of milk.

Saturday night's milk set in tank of ice water and stirred with dipper.

Date.	Pounds milk in each can.	Temp. of air. Min. and max.	Temp. of milk. (Range.)	Rennet test on Monday morning. Seconds.	Remarks.
July 15........	110	72° to 82°	62° to 64°	9	Milk would be rejected at a factory.
			52° to 54°	25	Good condition.
" 22........	95	67° to 73°	56° to 58°	25	" "
			46° to 48°	35	" "
" 29........	98	52° to 70°	56° to 58°	26	" "
			46° to 48°	37	" "
Aug. 5........	96	56° to 73°	58° to 60°	24	" "
			50° to 52°	30	" "
" 12........	95	52° to 70°	54° to 56°	31	One lot was divided into 3 shot-gun cans. No difference in rennet test.
			54° to 56°	31	

Careful *vs.* Rough Handling of the Curd.

On July 7th and 8th 1200 pounds of milk were thoroughly mixed in a vat each day. Six hundred pounds were then weighed into another vat and both treated exactly alike except that one vat of curd was handled very roughly at cutting, and during the heating process the other vat was handled as carefully as possible to see the effects upon yields of cheese and texture of the cheese. The 600 pounds of milk handled carefully yielded about one pound of cheese extra, as compared with 600 pounds of similar milk handled carelessly. There was not much difference in the quality of the cheese. The texture was practically the same in both lots.

On July 10th 1200 pounds of milk as delivered by the patrons were placed into one

vat, and 1200 pounds put into another vat. The treatment was the same as on the 7th and 8th, except that the milk was not previously mixed together. Again there was an increased yield of cheese from that which was carefully handled, but the difference in quality was very little.

The lesson to be learned is that cheesemakers should handle the curd very carefully at the cutting and also during the heating of the curd, or there will be a loss of cheese. On a vat containing 6,000 pounds of milk the loss may be as much as 10 pounds of cheese. This loss will nearly equal the extra wages of a first-class maker over what is paid to an inferior man that is careless in his work.

Curing Cheese at Different Temperatures.

These experiments were conducted on much the same lines as those of last year. The College curing-room is divided into three compartments which were kept on an average temperature of about 60°, 65° and 70° respectively.

The cheese made in the College dairy each day from May to October were always from the same vat of milk and when taken from the press were carefully weighed and marked A. B. and C. They were then placed in the different rooms at the temperatures given. These cheese were weighed at the end of a month and the per cent. of shrinkage noted. The cheese were scored at different times by experts. Two lots were sent to Stratford for scoring by Thos. Ballantyne & Sons, and by Mr. I. W. Steinhoff. Messrs. A. T. Bell, I. W. Steinhoff and G. J. Brill scored the September and October cheese on Nov. 17th. each scoring separately, and where there was much difference in the scores, the three judges together scored them a fourth time.

Green cheese were also obtained from the Freelton factory during the five months from June to October, and from the Rockwood factory during four months, June to September. One lot of three cheese were got from each factory every month. These were carefully weighed, marked and placed in the curing-rooms along with the College cheese.

The main points of the experiments are summarized in the tables.

Four experiments, factory at Rockwood.	A.	B.	C.
Size of room, cubic feet	863.	1,844.	863.
Method of controlling the temperature	Ice.	Sub-earth duct.	No control.
Method of controlling moisture	"	"	"
Highest temperature in room	67.°	72.°	80.°
Lowest "	52.°	58.°	56.°
Average "	59.4°	64.8°	68.3°
Highest per cent. moisture in room	90.	90.	90.
Lowest "	67.	53.	50.
Average "	80.0	79.0	72.6
Average per cent. shrinkage in cheese in one month	2.71	2.78	3.26
Quality of cheese: Average flavor ....Max. 40	32.11	30.0	29.22
" closeness " 15	13.88	13.66	13.67
" color " 15	14.11	13.78	14.00
" texture " 20	17.78	16.89	16.55
" total score " 100	87.88	84.33	83.44
Five experiments, factory at Freelton.			
Average per cent. shrinkage in cheese in one month	2.10	2.23	2.78
Quality of cheese: Average flavor ....Max. 40	35.58	33.25	33.83
" closeness " 15	14.46	14.00	13.75
" color " 15	13.83	13.75	13.50
" texture " 20	17.17	16.58	15.50
" total score " 100	91.04	87.58	86.58

Summary of cheese-curing experiments, six months, May to October. Cheese made

in College dairy. The highest outside temperature was 98 degrees, the lowest 18 degrees, and the average 59 degrees.

Total number of experiments, 54.		A.	B.	C.
Size of room, cubic feet		863.	1,844.	863.
Method of controlling temperature		Ice.	Sub-earth duct.	No control.
Method of controlling moisture		"	"	"
Highest temperature in room		67.°	72.°	80.°
Lowest "		52.°	58.°	56.°
Average "		59.4°	64.8°	68.3°
Highest per cent. moisture in room		90.	90.	90.
Lowest "		67.	53.	50.
Average "		80.0	79.0	72.6
Average per cent. shrinkage in cheese in one month		4.40	4.54	4.89
Quality of cheese	Average flavor ... Max. 40	36.01	35.46	35.51
	" closeness ... " 15	13.62	13.27	13.15
	" color ... " 15	14.23	14.21	14.12
	" texture ... " 20	18.15	17.69	17.53
	" total score ... " 100	92.01	90.63	90.31

Conclusions.

1. The shrinkage, or loss in weight, during the curing for one month was about one half of one per cent. greater curing at 70° as compared with curing at 60°. A factory making half a ton of cheese per day would lose five pounds more per day in the curing at 70°, as compared with curing at 60°. Five pounds of cheese would mean a loss of about 50 cents per day during the past season. For 200 days the difference in loss would be about $100 on shrinkage alone.

2. The cheese cured at a temperature of about 60° were also better in quality, though there is not the same marked difference as there was last year. This is accounted for by the fact that the nights were much cooler this past season, and the strong demand for cheese inclined the judges to look with more favor on the cheese which were cured most at the time of scoring. This was especially noticeable in the lots sent to Stratford.

There was the same difference in quality of the cheese made in the two factories where the weights of the cheese were 75 to 80 lbs. as there was in the College cheese weighing about 30 lbs., or even more so, especially in flavor. It was more pronounced in the Rockwood cheese, which apparently had more moisture. It will be noticed in the table that the difference in flavor of the College cheese was only about half a point as the average of the season, while the difference in flavor of the Rockwood cheese was about three points, and in Freelton cheese two points. The difference in texture also is not so marked as it was last year, there being but half a point in the College cheese, one point in the Rockwood, and one and a half points in the Freelton cheese by curing at 60° and 70° respectively.

Curing Cheese at High Temperature for a Week, then Placing in Medium and in Cool Rooms.

From May 15th to July 15th five cheese were made from one vat of milk on eleven different dates. These cheese weighed about 30 lbs. each. Three of them were placed in the room averaging about 70° as soon as taken from the hoops. At the end of a week one of these three was placed in the cool room, averaging about 60°, and another was placed in the medium room, averaging about 65°, while the third was allowed to remain in the warm temperature. One each of the remaining five cheese were placed in the cool and medium temperatures at once after taking them from the hoops. The object of these experiments was to note the effects on shrinkage and quality of cheese from placing the green cheese for a while in a warm room to start the curing or ripening and then finish the process in a cool and medium temperature.

The average shrinkage of the cheese placed in the cool room and allowed to ripen there was 4.31. Those placed in a medium temperature lost 4.73 per cent., and those cured at 70° lost an average of 5.05 per cent. The cheese placed in the warm room and then moved to a cool room lost 4.25 per cent. in weight during the four weeks, and the lot moved from the warm room to a medium temperature lot 4.62 per cent. in four weeks, one week of which was in the warm room.

The conclusion may be drawn that the loss of weight during the curing is almost directly affected by the temperature of the curing-room. The higher the temperature the greater the loss of weight while ripening. Other factors no doubt affect this loss, but temperature seems to be a very important one.

Quality of the Cheese Cured at Five Temperatures.

Av. Temperature for Curing.	Av. Flavor. Max. 40.	Av. Closeness. Max. 15.	Av. Color. Max. 15.	Av. Texture. Max. 20.	Av. Total. Max. 100.
60°	36.71	13.75	14.06	18.33	92.85
65°	36.29	13.47	14.12	17.97	91.85
69°	35.87	13.27	14.12	17.69	90.97
69° one week then 60°	36.24	13.52	14.13	18.02	91.92
69° one week then 65°	36.35	13.61	14.06	18.15	92.17
Average of all.	36.29	13.52	14.09	18.03	91.95

Conclusions.—It will be seen by the foregoing table that there was little difference in the quality of the cheese cured at these different temperatures. What difference there is in quality is in favor of curing at about 60°. Curing at 69° for a week and then curing at 60° for the remainder of the time gave practically the same results as curing at 65° for the whole period, and slightly better results than curing at 69° for the full term. Curing at 69° for a week, then finishing at 65°, gave the next best results to curing at 60°. Taking the results as a whole there was not the difference in quality we might expect, judging from the results of experiments in 1898; but there is apparently no advantage in curing at a high temperature for a week, as advocated by some authorities. However, another year's experiments may give different results.

A Bad Flavor in Cheese.

In the Middlesex and Elgin districts this past season the makers were greatly troubled with a bad flavor in the curd and cheese. In these sections it is locally termed "the Billy Goat flavor." It was also troublesome more or less in other western sections, where it is sometimes called a "Goose flavor." Mr. Stratton found that it is also giving some difficulty in the eastern factories. One of the worst cases was at Avon, in Elgin county. A peculiarity of the flavor is that it can seldom be detected in the milk, although Mr. Scott, of Harrietsville, says he detected it one morning in the milk, and the flavor was present on the curd and in the cheese. The milk appears to work normal, or at times a little "fast," and the flavor does not appear to develop until the acid shows on the curd, as tested by the hot iron. I brought a sample of two cheese from the Avon factory and submitted them to the College bacteriologist. He made cultures from them, and we made cheese from some of the cultures, but there was no "Billy Goat flavor" about the cultures or the cheese.

Later the maker sent down some curd that had the "flavor," and a culture from this gave the undesirable aroma in the curd and in the cheese. This curd was from the only batch in the Avon factory having this flavor from August 1st to August 10th. Another peculiarity about the flavor is that it does not appear every day but may skip several days, and when the maker thinks that his troubles are past it reappears in one or more vats. Sometimes it may be in one vat only, sometimes in two, or in several.

The cheese made from a culture of this bad-flavored curd had all the characteristics of the "B. G." flavor for two or three weeks. It gradually disappeared, however, until, when scored on Nov. 17th, it could not be detected, and the cheese was very fair in quality.

Mr. Archie Smith, one of the instructors for the Western Cheese and Butter Association, gives the following as his method of treating the curd to overcome the difficulty: "Heat the milk to 84° in the vat and set, using not less than 3½ ounces of rennet per 1,000 lbs. milk. If the milk is working fast enough to allow the curd to dip in 2¾ to 3 hours I would heat up to 88° or 99° at once; but if the milk is working slowly, I should heat to but 94° to 96° and stir it continually until the acid begins to show on the hot iron. Then heat quickly to 99° or 100° and run the whey to the surface of the curd. Stir the curd well until it shows nearly an eighth of an inch of acid; then dip. The curd will be quite soft and I do not attempt to firm it at this stage, but merely turn it over three or four times quickly, so as not to allow it to mat together, being careful to bruise it as little as possible. Leave it spread over the curd sink three or four inches deep, then cut it in small narrow strips and do not pile it. By this method the curd will drain well, and there will be no loss of butter or white whey. The acid will develop very quickly, and when it shows 1 to 1¼ inches on the hot iron I would mill immediately. After milling wash it thoroughly with clean water at a temperature of 94° to 96°. This will wash out the sour whey, firm the curd and help the flavor. Keep the curd well spread over the sink, stir frequently, and do not allow it to mat. Air it as much as possible and keep up the temperature until just before salting. Cool to 80°, if you can do so, before putting to press. Use one-quarter of a pound more salt per 1,000 milk than with an ordinary curd."

Methods of Controlling Temperature in Cheese-curing Rooms During Hot Weather.

A great deal of interest has been aroused among cheese-makers and factory owners in the question of curing cheese at a moderate temperature in hot weather. Owing to the cool nights of the past season, and the great demand for cheese, the full benefits of the various systems advocated and used were not ascertained. It is in a hot season, with hot nights and a slow demand for cheese, that the value of sub-earth ducts, ice-boxes, air compressors, pans, etc., are demonstrated.

In connection with this question I visited the following factories in Western Ontario in April and May and gave help in the construction of ducts: Woodburn, Canboro' and Lyons. I also visited Nilestown, Dorchester, Harrietsville, Mapleton, and Glanworth factories about the same time. In July and August I visited Norwich Junction, Dunboyne, Malahide, Northwood, Lyons (2nd visit), Springfield, Brownsville, Culloden, Avon, Harrietsville (2nd visit), Strathallan, Tavistock, Woodburn, (2nd visit) Caistorville, (2nd visit), Canboro and Caledonia.

There are ducts in the following: Woodburn, Canboro', Caistorville, Caledonia, Lyons, and Dunboyne. At Springfield, Harrietsville, Strathallan, and Tavistock there were ice-boxes in the curing-rooms, but at Strathallan only did I find any ice in the boxes, though the rooms ranged from 70° to 73°. The temperature in the curing-room at Strathallan was 70° at about 5 feet from the floor, but the air at the bottom of the box was 60°, while in the shade outside it was 78° at the time of my visit on August 2nd. So far as I could gather from those who had the ice-boxes, they could prevent the temperature from going above 70° by a liberal use of ice, but the labor of getting in the ice is quite a serious drawback in factories where the help is limited.

At Nilestown there is a single row of iron pipe about the curing-room into which spring water may be turned when needed for cooling. This is a cheap and effective method where cold water is convenient.

Construction and Cost of Sub-earth Ducts.

Last year I described in detail the construction of the duct to the College curing-room. The following are some of the main points in the ducts which have been put in during the past season:

The first factory that I visited to give help in placing a sub-earth duct was that of Mr. J. N. Paget, Canboro', in Haldimand County. I assisted with the laying of the tile in April and again visited the factory in August. The soil is a heavy clay and gave considerable trouble by cav ng into the trench. This duct averages seven feet in depth and has four rows of 5-inch drain tile in the bottom of the trench, with one row of 5 inch and

two rows of 4-inch lying directly on top. A circular brick curb at the farther end of the duct forms the inlet for the air to the tile. It was Mr. Paget's belief that a tall pipe would not be necessary on top of the brick curb, but he found that the draft was not good, so he had a conical-shaped, wooden inlet made, with a cowl on top, made of galvanized iron. The wooden part is three feet square at the base and 20 inches at the top, made of 2x4 scantling and covered outside with half-inch lumber. The height is 31 feet, but the factory is located on the high bank of a creek, with no high buildings near to hinder the draft. The drain for water that might accumulate in the duct was placed at the factory end, because most convenient, though I would prefer it at the other end. The whole length of the duct is 150 feet, and cost $80.

I took the following observationson August 11th: Velocity of the wind outside, 250 to 500 ft. per minute. Velocity of air entering the curing room through the duct, 80 to 110 ft. per minute. Temperature outside in shade at 3 p.m., 78°; in the sun at side of curing-room 92°. Temperature in the duct 62°; in the room 72°. This curing-room is not well insulated, and it very seldom went above 72° during the summer. Mr. Paget is well pleased with the duct, and proposes to insulate the room thoroughly for the coming season, when the results will be better. (Since this was written have heard that factory was burned to the ground).

The second factory visited was Woodburn, in Wentworth County, owned by Mr. A. J. Edwards. I assisted in the laying of the tile in April and again called at the factory on August 10th. This duct is 152 feet long and averages seven feet deep. There are three rows of 6-inch drain tile in the bottom of the trench, and three other rows placed directly on top, though the joints were broken. The drain for carrying off water is about the centre of the duct. The inlet pipe was built 38 feet high at first, but the draft was very poor, owing to the fact that there are a number of tall elm trees near the factory and buildings on the side of the prevailing winds. He was compelled to add several feet to the intake pipe, and it is now 62 feet high with cowl on top, the whole made of galvanized iron, 15 inches in diameter. Before the intake pipe was heightened, Mr. Edwards tried lengthening the outlet pipe from the curing-room, but this was not satisfactory. The curing-room is well lined and has double windows and doors. On August 10th the velocity of the wind outside was 115 to 150 ft. per minute at 8 a.m. Inside, the air was entering at the rate of 50 to 75 feet per minute, though at times the draft was not suffito move the anemometer. The total cost of the duct was $65, exclusive of Mr. Edwards' own labor. He did most of the excavating and the carpenter work. He was pleased with the results after getting the inlet pipe of sufficient height.

The proprietor of the Caistorville factory is Mr. A. W. Edwards, a brother of Mr. A. J. Edwards He was at Woodburn at the time of my first call. He put a duct into his factory without any further assistance. The factory is on the bank of the Chippewa Creek, and Mr. Morrison, instructor for the Cheese and Butter Association, reported this duct during the summer as giving excellent satisfaction. The duct is 115 feet long and 8 feet deep. The tile consists of 3 rows of 5-inch, 2 rows of 6-inch and one row of 8-inch. The intake pipe is made of galvanized iron and is 30 feet high. The inlet to room is simply a hole cut in the floor, and the outlet is into a room above with no direct connection outside. The factory and curing-room are poorly constructed and the loss of "grease" was very great in former years.

In the forenoon of August 10th there was little or no draft into the room, though there was a very faint breeze outside. After dinner the wind outside was moving 115 to 270 feet per minute, and inside it was 70 to 155 feet per minute. The temperature outside in the shade was 78°, inside 68°, and in the duct 64°. In the early part of the season a stream of water flowed under the tile in the duct, and this, no doubt, helped considerably to cool the air, On August 10th the stream had practically dried up. The total cost of this duct was $65, exclusive of Mr. Edwards' own labor.

If the curing room were properly insulated this duct would give excellent service, although, as it is, the proprietor is well satisfied with his expenditure.

In the same district is the Caledonia factory, Haldimand County. The owner, Mr. J. M. Clysdale, built a duct 153 feet long and 6 feet deep. He used 7 rows of 5-inch tile, 4 in the bottom and 3 rows directly on top. This duct did not work so well as the others, owing to the fact that the inlet pipe is but 30 feet high and is located in a hollow, surrounded by trees. The pipe was made of boards put together lengthwise. He pur-

poses adding 15 or 20 feet to the pipe next season. The duct cost about $100. On Aug. 11th the temperature in the room at 8 a.m. was 70°, though it was but 68° in the shade outside. The air was very still, not enough to move the anemometer at times, though occasionally it reached 110 ft. per minute. There was no perceptible draft into the room. The curing room is a very large one, and the owner proposes to put a partition through it before another year.

The owner of the Lyons factory in Elgin Co. is Mr. J. H. Williams, an ex-student of the Dairy School. His duct is 168 feet long, and 6 to 8 feet deep. He used two rows of 10-inch tile. The intake pipe is made of inch boards put together lengthwise, with white lead and twine along the edges to make a tight joint. The pipe is 50 feet high with a galvanized iron cowl on top, the mouth of which is about 3½ feet in diameter. The pipe sits over a well, but is not connected with it any more than the opening on top. The tile of the duct also opens into this well. For leading the air from the duct into the curing-room Mr. Williams used tile with elbows to connect the main drain with the rooms, thus doing away with the need of curbs. This is the only place I have seen drain tile with the elbow for making a turn.

The velocity of the air outside on August 14th at 9 a.m. was 200 to 300 feet per minute. Coming into the room the air travelled 70 to 100 feet per minute. Temperature outside in shade was 70°, in the curing room 64°, in the duct 60°. The curing-room is divided and the rooms had not gone over 70°. The owner was very well pleased with the working of the duct. Mr. Williams wrote on Nov. 18th, "My duct cost me $60, but I would not be without it for a good deal more than this sum. In the hottest weather my curing-room never rose more than three degrees."

The Dunboyne Cheese Co., in Elgin Co., put in a duct about 80 feet long—60 outside the factory and 20 under the factory. The depth is 6 ft. at the inlet end and only about 3 ft. deep under the factory. It has 3 rows of 6-inch drain tile—2 in the bottom and one on top. The intake pipe is 25 feet high, made of galvanized iron, 10 inches in diameter with cowl on top. The air enters the curing-room through a house register set in the floor about the middle of the room. There are two outlets for the warm air from the room. At two o'clock in the afternoon of July 31st the temperature in the shade outside was 73°, in the curing-room it was 69°. Velocity of wind outside 200 to 300 ft. per minute; inside, 50 to 80 ft. per minute. I was unable to get the cost of the duct as none of the officers of the cheese company were present. The maker informed me that the results had not been so good as they anticipated, due, no doubt to the shortness and shallowness of the duct, especially as it ran through a sandy knoll which would warm quickly during hot weather.

Points in building sub-earth ducts:

1. Have the duct at least 100 ft. long, 150 to 200 ft. is better.
2. Have it at least 6 feet deep, 8 or 10 feet is better.
3. Use from 5 to 6 rows of 6-inch tile, or about 2 rows of 10-inch.
4. Have the intake pipe from 30 to 60 feet high—above all surrounding trees or buildings. It may be made of wood or galvanized iron.
5. Have the mouth of the cowl from 3 to 4 feet in diameter, and the vane so constructed that it responds readily to changes in the direction of the wind.
6. Make the connection between the intake pipe and the tile in the ground, as well as the connection between the tile and the curing-room, by means of a wooden or brick curb, or by the use of tile having an elbow for the turn.
7. Regulate the inlet of air to the curing-room by means of a register, or by a small door on hinges.
8. Regulate the outlet of warm air from the room by means of an ordinary ventilator. The height or size of this ventilator does not appear to be a very important point.
9. Have the cool air enter at one side of the room and the warm air leave at the opposite side, or have the cool air enter at two to four different points near the walls, and the warm air to leave near the centre of the room.

A duct for an ordinary factory need not cost over $60 to $100.

Methods Other Than the Sub-earth Duct.

Water.—As previously noted, the Nilestown factory has a single row of water pipe around the room and this is filled with cold spring water for cooling the room. In factories

that are so situated where they have an abundance ot cold water, the curing-room may be cooled by means of water. The pipes used for cooling may also be used for heating from the boiler in cold weather, by having suitable valves and connections for heating, allow one linear foot of inch pipe for each 20 cubic feet of space to be warmed. These pipes may be conveniently arranged along two or three sides of the curing-room or between the shelves and may be used for both heating and cooling. Drip pans under the pipes would be necessary for the summer, to catch the condensed moisture of the room.

Fans.—The cheesemaker at the York factory, Mr. Bond, purposes using a "blower" or fan, similar to that used in the saw-mill at York, for cooling his curing-room. Mr. Morrison, inspected the "blower" at the saw-mill in October at my request, and sends the following notes: "I examined the saw-dust blower, of which Mr. Bond spoke when in Brantford and found it to be a wooden cylinder, two feet in diameter, having four fans 6 in. x 6 in. The cylinder makes 2,200 revolutions per minute, and the dust is forced through a 7 inch stove pipe, 35 feet long. The temperature of the air at the entrance of the blower was 63°, and at the outlet of the pipe the air came out at 53°. The proprietor claims that no matter if the air is 70° or 80° at the entrance, it will come out at 52° after it has been running for some time."

This is a method of cooling curing-rooms that is worth looking carefully into.

Compressed Air for Cooling Curing-Rooms.

In the latter part of August, Mr. Stratton, our cheesemaker, visited the following factories in eastern Ontario, to note methods adopted there for controlling temperature in cheese curing-rooms: Kingston Dairy School, Cataraqui, Collins' Bay, Bayside, Gilead, Algonquin, Domville, Glenmore, North Augusta, Roebuck, South Branch, Willow, Bishop's Mills, Farmers' Union, Farmers' Own, Old Fairfield, Rideau Valley, Roseville, Barlow, Glen Buell, Maple Grange, Orchard Valley, Newbliss, New Klondike, Addison, and Frankville.

At the Kingston Dairy School he found the rooms fitted similarly to our own at Guelph, with a sub-earth duct and ice for cooling. The most interesting factory, and about the only one visited which had done anything special to control the temperature, was Mr. J. W. Newman's, at Roebuck, in Grenville Co. Mr. Newman is a graduate of our 1899 dairy class. On his return to practical work in the spring of this year he began investigating the question of temperature in the curing-rooms, and, as a result, concluded that compressed air would best serve his purpose in maintaing a moderately uniform temperatnre of 60° to 65°. Mr. Newman very kindly furnished the following details of the system used in his factory:

1. The contents of our reservoir is about 140 cubic feet.
2. The contents of our curing-room is about 4,700 cubic feet or about 34 times that of reservoir.
3. Our compressor (a Westinghouse 8 in. x 8 in.) should deposit 20-43 of one cubic foot of air at each full stroke.
4. Our compressor makes about 3,300 full strokes to fill reservoir to 90 lbs. pressure in 45 minutes.
5. At 90 lbs. pressure, air is compressed about seven times.
6. At 90 lbs. pressure our reservoir contains about 1,000 cubic feet of air at natural density.
7. Emptying our reservoir from 90 lbs pressure to 0 actually cools our room from 10 to 12 degrees F., though the room is not well insulated.
8. The air to be compressed should be taken from near the ceiling of the curing-room.
9. The compressed air should be passed through brine to cool it and also to purify it. It may also be stored in brine tanks for future use.
10. It requires an average of four horse-power for 45 minutes to fill the reservoir to 90 lbs. pressure, though at 90 lbs. pressure 6 horse-power is required.

Mr. Newman adds: "I believe this system could be simplified and cheapened so as to displace all other systems for cooling to moderate temperatures."

Effect on Fat in Milk when Cows are First Put on Pasture in the Spring.

For seventeen days before the cows in the dairy herd were turned on pasture—from

May 15th to May 31st—the milk from the whole herd was sampled carefully and weighed. The per cent. of fat was determined with the Babcock tester. The average per cent. of fat in the morning's milk was 3.69. In the evening it averaged 3.8 for the seventeen days. The lowest test was on the morning of May 20th, when the fat was 3.3 per cent. The highest was 4.7 on the evening of May 16th.

On June 1st the cows were turned out to pasture and the average percentage of fat in the morning's milk was 4.36 for the next seventeen days. The evening's milk averaged 4.47. The milk tested 3.5 on the morning of June 1st. The evening milk of the 1st of June tested 3.6. The morning's milk of the 2nd tested 3.9 and the evening's milk tested 3.4—the lowest test during the seventeen days after being turned out to pasture. The highest test was 5.3 per cent. of fat on the evening of June 16th. The average of both the morning and evening tests was higher during the first seventeen days on pasture than it was when the cows were in the stable and yard. This agrees with experiments made in previous years, which showed that the cows of our herd gave richer milk when first turned out to pasture than they did in the stable. This is contrary to the views of most dairymen, who are of the opinion that "grass makes thinner milk."

The cows also gave more milk on the pasture. Whether this difference in the quantity and quality of the milk was altogether due to the feed or not is an open question. The probabilities are that the difference was due more to the congenial surroundings of the cows than directly to the feed.

Changes in Colostrum Milk During 21 Milkings.

During the season tests were made with the lactometer and Babcock tests of five cows in the herd for the first 21 milkings after freshening, or dropping the calf. The cows comprised one Holstein and one Holstein grade, an Ayrshire and two Ayrshire grades. The calves were removed shortly after being dropped and the cows were milked by hand. In four cases the Quevenne lactometer would not test the specific gravity of the first milking, and in the case of two cows it would not register the gravity of the second milking.

The first and second milkings gave a decided purple tinge to the precipitate when sulphuric acid was used. This purple tinge was not apparent after the third or fourth milking. The purple tinge is probably caused by an excess of albuminoids in the milk, and points to a method whereby colostrum milk may be detected. With most of the cows the milk appeared normal after the eighth or ninth milking. In some the seventh milking appeared normal.

There was quite a marked difference in the per cent. of fat contained in the first milking of the five cows. One cow tested 8.4; the others tested 3.5, 4.1, 2.2 and 3 per cent. fat. The fat varied a great deal with the different cows and with the same cow.

Table showing lactometer readings and percentage of fat in freshly calved cows' milk, grouped in three periods:

Cows.	First 8 Milkings		Second 8 Milkings.		Third 5 Milkings.		Date of Calving.
	Average Lact. reading.	Average per cent Fat.	Average Lact. reading.	Average per cent. Fat.	Average Lact. reading.	Average per cent. Fat.	
Jean	35.2	4.2	34.2	3.25	32.36	3.14	April 10, 1899.
Patience	36.7	3.77	33.62	3.59	34.10	3.44	April 24, 1899.
Meg	33.14	3.72	32.60	3.94	32.70	3.60	April 25, 1899.
Ethel	34.95	2.95	33.24	3.59	32.00	3.90	Aug. 28, 1899.
Elsie	25.48	3.13	33.94	3.24	33.86	3 00	Aug. 28, 1899.
Average	35.09	3.55	33.52	3.52	33.00	3.41	

1. There was a gradual decrease in the per cent. of fat and the per cent of solids not fat with three cows, and a decrease of the solids not fat in the milk of all five cows from the 1st to the 21st milking. In the case of one cow, Ethel, an Ayrshire grade, the per cent. of fat increased from the 1st to the 21st milking, while another grade Ayrshire was lower in fat for the first eight milkings, then increased, and afterwards decreased.

2. Milk is not normal until the 8th or 9th milking after calving, and in some cases the 12th or 14th milking contains an abnormal proportion of solids not fat.

Pasteurized vs. Raw Skim-milk for Calves.

This is an experiment similar to one reported last year. The conditions were much the same as those of last year. Four calves were selected for the experiment, two of which belonged to the dairy breeds and two to the beef breeds. One of each was placed together for feeding, and the surprising thing was that the two calves belonging to the dairy breeds made greater gains than the other two—118 lbs. as against 97 lbs. The gains were not so good as last year in either lot. In addition to the milk and meal, given as reported in the table, each calf was given silage, hay, grass, and green peas and oats according to their appetites.

Name.	Breed.	Dropped.	Lbs. milk consumed in four weeks.	Kind of milk.	Lbs. meal—corn meal and bran in equal parts.	Lbs. grain during four weeks.	Period.
1. Whitehead .	Grade Hereford steer.	Dec. 22, 1898	616	Pasteurized.	14	23	May 9 to June 6.
			560	Raw	28	16	June 13 to July 11.
2. Lily	Jersey	Nov. 10, 1898	616	Pasteurized.	14	14	May 9 to June 6.
			560	Raw	28	27	June 13 to July 11.
3. Dora	Grade Shorthorn	Jan. 28, 1899	6J6	Raw	14	28	May 9 to June 6.
			560	Pasteurized.	28	30	June 13 to July 11.
4. Topsy ...	Grade Holstein	Dec. 31, 1898	616	Raw	14	34	May 9 to June 6.
			560	Pasteurized.	28	43	June 13 to July 11.

1. The total gain of the four calves when fed on pasteurized skim-milk was 110½ lbs. The total gain on raw milk was 105 lbs. In 1898, the gain on pasteurized skim-milk was 20 lbs. more than the gain on raw skim-milk. There is thus an agreement in the two years' experiments in favor of the pasteurized, or scalded skim-milk for calves.

2. We would recommend creameries to scald the skim-milk before returning it to patrons. Pasteurized (heated to 160°) skim-milk, along with meal, makes excellent food for young stock.

Dilution Creamers, or "Separators," so-called.

In the spring of the present year we received a number of letters in reference to the value of dilution "separators." Among those we were asked to pass an opinion upon were the "Hydro-lactic," made by J. F. Gill & Co., Niagara Falls, Ont.; the "Wheeler,' made in Syracuse, N.Y.; and the "Aquatic," made in Watertown, N.Y.

Method of creaming.	Llbs. milk set.	Average per cent. fat in who'e milk.	Average time set. Hours.	Per cent. milk taken as cream.	Per cent. fat in skim-milk.	Quality of Butter. Flavor, 45.	Grain, 25.	Color, 15.	Total, 0.
April Experiments.									
Hydro-lactic........................	480	3.9	14.5	17	0.60	37	24	14	90
Diluted in Cooley cans	330	3.9	15.5	18	0.62	36	24	14	89
Brampton (no water added to milk)	345	3.9	20.6	16	0.68*	38	24	15	92
November Experiments.									
Hydro-lactic	300	4.0	24	.....	0.53	....	....	....	....
Wheeler............................	300	4.0	24	......	0.50	... .	....	....	....
Cooley (undiluted)	300	4.0	24	....	0.50	....	....	....	....

* On April 15th and 16th the per cent. fat in Brampton skim-milk was 1.2 and 1.0, which caused the high average for this creamer.

The manufacturers kindly furnished us with one each of the "Hydro-lactic" and "Wheeler." During April, 13 experiments were made comparing the "Hydro-lactic" with the Brampton creamer, and also with milk set in Cooley cans, diluted with one-half

water. The cans of diluted milk were set on the floor of the basement and not in water. Ice water surrounded the cans set in the Brampton creamer. In the "Hydro-lactic," an equal quantity of milk and cold water were placed in the "separator," or creamer—a more correct name. The milk set in the three creamers was first thoroughly mixed together and then divided into three parts, and about the same quantity was set in each. The table shows the main points of experiments made when the cows were in the stable during the months of April and November.

1. There was little or no advantage gained by using the dilution creamers as compared with the ordinary creamers, in which the milk was set in ice water without dilution. In neither cases were the results satisfactory. The loss of fat in the skim-milk was too great. The centrifugal cream separator would remove practically all of the fat.

2. The results were more unsatisfactory by allowing the milk to sit but three to four hours after diluting, as recommended by the manufacturers.

3. As good results were obtained by diluting in an ordinary shot-gun, or Cooley can, as by the use of the "separator," though the cans are not so convenient.

4. The quality of the butter and skim-milk was not so good from the dilution methods.

5. If a dairyman had not ice, cold water, or a centrifugal separator, and did not value the skim-milk, or was in the habit of diluting the skim-milk "to make it go round," he might use the dilution system to advantage. It would then become a question whether he should pay the price asked for these "separators" or use an ordinary shot-gun can, which would give him just as good results, though not quite so convenient. Adding water to the milk in order to help the cream to rise might also be an advantage with "stripper" or "farrow" cows' milk, as it reduces the viscosity and enables the cream to rise more readily.

Ripening Cream with Different Percentages of Starter.

These experiments are a continuation of those made in 1897 and 1898. Twelve experiments were made in August and September by using no starter in some cases, 5 per cent. in others, and 15 and 20 per cent. in others. The cream was first thoroughly mixed and then evenly divided into two lots by carefully weighing the cream. The starter was added at once after dividing the cream, and the two lots kept at the same temperature until thickening, when it was cooled to churning temperature. Where no starter—or not more than 5 per cent.—was used, it was not cooled until the following morning. When 15 to 20 per cent. starter was used, the cream was cooled to churning temperature the same evening that the starter was added, and allowed to stand at the lower temperature during the night

Altogether there were used in these experiments 15,831 lbs. of milk, containing an average of 3.4 per cent. fat. The average per cent. fat in the skim-milk was 0.125. The average per cent. fat in the buttermilk was nearly one-tenth, being slightly less where 5 per cent. starter was used. The acidity of the cream at churning was .49 with no starter, .59 with 5 per cent. starter and .61 and .55 with 15 and 20 per cent. starter. The yield of butter was slightly greater in those churnings where 20 per cent. of starter was used in ripening the cream. The score of the butter was :—

Per cent. starter in cream.	Flavor. (45)	Grain. (25)	Color. (15)	Salting. (10)	Package. (5)	Total. (100)
	Av.	Av.	Av.	Av.	Av.	Av.
No starter	41.7	23	13.3	10	5	93
5 per cent. starter	41.0	24	13.0	10	5	93
15 " "	41.8	23.3	13.2	10	5	93.3
20 " "	41.0	24.2	13.2	10	5	93 4

The starter caused the cream to ripen more quickly, but there was little or no difference in the quality of the butter. This agrees with the results obtained for the past two years.

Ripening Cream at Different Temperatures.

During July and August 21 experiments were made similar to those of last year to note the effects of ripening cream at a moderately high temperature (70° to 75°) and ripening a portion of the same cream at a temperature of 55° to 60°. Altogether there were used in the experiments 26,986 lbs. milk, containing an average of 3.44 per cent. fat. After separating, the cream was thoroughly mixed and then equally divided in two cream vats.

——	Cream ripened at 70° to 75°.	Cream ripened at 55° to 60°.
Average per cent. acid in cream at churning time	.571	.508
" " fat in buttermilk	.072	.074
" time for churning	30 mins.	34 mins.
Total lbs. butter made	495.5	497.5
Pounds butter made per 1,000 lbs. milk	36.7	36.8
Average per cent. of overrun	6.7	7.2
" score of flavor (Max. 45)	41.1	42.4
" " grain (" 25)	23	23.8
" " color (" 15)	13.3	14
" total score (" 100)	92.2	95.2

The yield of butter was slightly greater from ripening at the lower temperature, and the quality of the butter was also somewhat better—three points as the average of 21 lots. This agrees with previous results. We have had best results in summer from ripening at a temperature not over 65°, though the difference in quality of butter is not very great, as shown by the average of three years' experiments.

Pasteurizing Milk and Cream for Buttermaking.

During April and May two series of experiments were conducted to see the effect of pasteurization on milk for buttermaking. A "Reid pasteurizer" was used for the work. The milk was first thoroughly mixed in a 3,000 lb. vat; then one-half was carefully weighed and run through the pasteurizer. The other half was separated at 95° to 100° and heated in an ordinary channel heater. The next day the milk for separating at ordinary temperature was weighed out first, and the remainder pasteurized in order to check any differences there might be as a result of the weighing and handling. The temperature for pasteurizing ranged from 155° to 162°. The total quantity of milk used in these experiments was 52,968 lbs. Average per cent. fat in whole milk, 3.5. The average per cent. fat in pasteurized skim-milk was .042 ; unpasteurized, .1. There were 3,119 lbs. cream from the pasteurized milk and 3,496 lbs. from the unpasteurized. The average per cent. fat in the cream from pasteurized milk was 27.3; from raw or unpasteurized, 25.6. The average per cent. acid at churning in the cream from pasteurized milk was .515 ; from raw or unpasteurized, .498. Time of churning, 29.9 minutes and 33 minutes, respectively. The average lbs. of butter per 1,000 lbs. pasteurized milk was 39.7 ; unpasteurized, 40.2. The per cent. of overrun was 13.5 and 14.9 respectively from pasteurized and raw milk.

In the first series, from April 4th to 25th, the butter was packed in 56-lb. boxes. Six boxes of butter from pasteurized milk and six from raw milk were sent to Thos. Ballantyne & Sons, Stratford, for scoring. An equal number of every other day's make was sent to D. Derbyshire & Co., Brockville, for scoring. We requested from each that an odd and even numbered box should be retained for scoring at the end of one month and again at the end of three months. These firms were not aware as to how the butter had been made or what the numbers referred to. Messrs. Derbyshire & Co. spoke of the shipment in the highest terms of praise. Messrs. Ballantyne & Sons say they find that the reports of their scorers usually compare very closely with reports of scores received from Manchester. We are indebted to these firms for their kindness in scoring and storing the boxes sent to them.

TABLE SHOWING SCORES OF PASTEURIZED AND UNPASTEURIZED BUTTER.

Butter.	Scorer.	Date of Scoring.	Flavor. (45)	Grain. (25)	Total. (100)
(1st series.)			(Average.)	(Average.)	(Average.)
Unpasteurized...........	Thos. Ballantyne & Sons..	May 8th...	41.3	23.3	94.5
Pasteurized.............	" " ..	" 8th...	41.6	23.1	94.8
Unpasteurized...........	D. Derbyshire & Co.......	" 17th...	42.5	24.5	97.0
Pasteurized.............	" "	" 17th...	43.6	24.6	98.3
(2nd series.)					
Unpasteurized..........	Thos. Ballantyne & Sons	June 12th..	43.2	22.2	95.5
Pasteurized..............	" " ..	" 12th..	42.5	23.0	95.5
(1st series.)					
One of each box scored three times.					
Unpasteurized...........	Thos. Ballantyne & Sons..	May 8th....	43	24	97
Same box unpasteurized..	" " ..	June 12th ..	35	23	88
" " ..	" " ..	Aug. 17th ..	31	24	80
Pasteurized............	" " ..	May 8th....	42	23	95
Same box pasteurized....	" " ..	June 12th ..	40	23	93
" "	" " ..	Aug. 17th ..	38	24	87
Unpasteurized...........	D. Derbyshire & Co.......	May 17th...	44	25	99
Same box unpasteurized..	" "	June 21st ..	42	25	95
" " ..	" "	Aug. 11th ..	40	25	95
Pasteurized.............	" "	May 17th...	42	25	97
Same box pasteurized....	" "	June 21st...	40	25	95
" "	" "	Aug. 11th ..	39	25	94
(2nd series.)					
Unpasteurized...........	Thos. Ballantyne & Sons..	June 12th ..	44	23	97
"	" " ..	Aug. 17th ..	39	24	92
Pasteurized	" " ..	June 12th ..	42	23	95
"	" " ..	Aug. 17th ..	38	24	91

From May 22nd to May 29th a second series was completed. Five boxes of each (pasteurized and raw milk butter) were sent to Thos. Ballantyne & Sons for scoring. There was also in this lot a box each made from pasteurized and raw cream. The butter was scored on June 12th. Two boxes—one of each kind, made on the same day and from the same milk—were scored again on Aug. 17th, having been kept in the firm's cold storage in the meantime. The table shows the average scorings in flavor, grain and totals as given by each firm; also detailed scoring of flavor, grain and totals for the boxes kept, to test keeping quality of the butter from pasteurized and raw milk.

CONCLUSIONS:

1. There was less loss of fat in the skim-milk from pasteurizing the whole milk before separating.

2. There was less volume of cream from pasteurized milk, but the cream was richer.

3. By using a starter, after cooling, there was no do difficulty in ripening the cream from pasteurized milk.

4. The pasteurized cream churned in less time than the raw cream.

5. The yield of butter, per 1,000 lbs. of milk, was .89 lbs. greater from the unpasteurized milk. (This may have been due to a dryer butter having been made from the pasteurized milk, and more moisture left in the raw milk butter.)

6. There was not much difference in the quality of the butter when first made. The average of the first scorings from both firms was 42.6 for flavor and 23.6 for grain in the pasteurized. The unpasteurized averaged 42.2 and 23.3 for flavor and grain.

The three boxes of pasteurized butter which were scored several times, averaged 42 in flavor, and 23.6 in grain on the first scoring. The unpasteurized averaged 43.6 and 24 for flavor and grain. The second scorings were 39.3 and 24 for flavor and grain of the pasteurized, and 38.6 and 24 for the unpasteurized. The third scorings were 38.5 and 24.5 for the pasteurized and 35.5 and 24.5 for the unpasteurized in flavor and grain.

One box of pasteurized butter scored 100 points by Derbyshire & Co. Thirteen boxes of unpasteurized butter scored 95 points and over, and sixteen boxes from the pasteurized milk scored 95 points or over.

In the first series, the box of pasteurized butter sent Ballantyne & Sons, scored 42 for flavor on May 8th; 40, on June 12th; and 38, on August 17th The unpasteurized box made on the same day and from the same vat of milk scored 43, 35, and 31 on the same dates. The box of pasteurized butter held its flavor much better than the butter made from unpasteurized, or raw, milk

The box of unpasteurized butter kept by D. Derbyshire & Co., in cold storage, scored higher at all three scorings, though the pasteurized butter lost but three points in flavor during the three months, while the box of unpasteurized lost four points in the same length of time and under the same conditions.

In the second series, the box of unpasteurized sent to Ballantyne & Sons scored higher than the pasteurized (44) when first examined, and was still higher (39) when scored two months later, but it lost *five* points in flavor in the two months, while the box of pasteurized butter made on the same day and out of the same milk, lost but *four* points in flavor, scoring 42 and 38 in the two tests.

All the trials indicate that the pasteurized milk butter had better keeping quality, though when first made there was little or no difference in the quality. The chief advantage in pasteurization is in making butter for the export trade or for storing; and also in winter, when feed and other bad flavors give the butter-maker trouble.

7. By pasteurizing we found that the skim-milk kept sweet from 24 to 48 hours longer than the skim-milk from the separator where the whole milk was not heated to 160°. The same results may be obtained by heating the skim-milk *after* separating.

Mangels vs. Turnips Fed to Cows for Buttermaking.

Early in April we commenced an experiment to ascertain the difference in the quality of butter from cows fed on turnips and mangels. The cows on one side of the stable were given all the mangels they would eat, along with other food; and those on the other side were given all the turnips they would eat, along with other food. Owing to the scarcity of roots, the experiment was not continued for a sufficient length of time to come to any definite conclusions as to the relative merits of these two roots for the production of butter. The average score of the turnip butter was 37 for flavor, while the mangels produced butter which scored an average of 39.3, out of 45, indicating that the mangels were slightly superior for producing good flavor, although there was not the difference in flavor which we expected.

The Dairy Herd.

We maintain a herd of about 30 milking cows and heifers in the Dairy department, of which about 25 are in milk all the time. On December 31st, 1899, we have the following pure-breds:—5 Holstein cows and heifers and 3 calves, 4 Jerseys and 3 calves, 1 Ayrshire cow and 1 heifer calf, 21 grade cows and heifers and 3 grade heifer calves.

The milk from the herd is weighed at the dairy and a sample taken the same as if the milk came from a patron. At the prices paid patons for milk this past season, our cows furnished by months the following values:—January, $135.57; February, $135.14; March, $128.00; April, $163.32; May, $128.99; June, $132.41; July, $112.22; August, $103.69; September, $113.56; October, $96.41; November, $105.90; December, $90.56, making a total for the year of $1,445.77. In addition, a considerable quantity of milk is used for rearing young calves, and about five dollars per month is received for milk sold by the quart to customers who come to the dairy stable for it. Outside of the milk used

for rearing stock, the milk supplied by the dairy herd was worth during the past year over fifteen hundred dollars at the prices we are compelled to pay in the vicinity of Guelph for milk to be used in the Dairy School and for experimental purposes.

The record of all cows which have been in the herd for the full time of the year ending November 30th, 1899, is as follows :

Name of cows.	Weight.	Calved.	Breed.	No. days milking.	Total lbs. milk.	Per cent. fat.			Total lbs. fat.	Total lbs. butter, adding 15 % to butter fat.	Remarks.
						Highest weekly.	Lowest weekly.	Yearly average.			
Annie	1,195	Nov. 12, '98.	Jers. Grade.	304	7,400	4.6	3.3	4.04	299.46	344.38	
Belle Temple.	980	Jan. 2	Jersey	315	5,576	6.1	4.0	4.87	271.68	312.43	
Bella.........	1,195	July 17	AyrshireG'd	355	6,107	4.5	2.8	3.8	232.62	267.51	3 yrs. old, 2d calf.
Birdie........	1,165	Dec. 22, '98.	Grade......	335	7,185	4.3	3.5	3.9	280.34	322.39	
Dolly.........	1,210	Oct. 31.....	Hol. Grade.	286	6,000	3.6	3.0	3.4	205.10	235.86	3 yrs. old, 1st calf.
Elsie	1,093	Aug. 27	Ayr. " .	227	4,721	3.8	2.9	3.28	155.35	178.65	
Ethel	820	" 28	" " .	223	4,952	4.2	3.4	3.8	192.74	221.65	
Grey	1,150	Feb. 26.....	S.-H. " .	281	9,052	5.1	3.0	3.44	311.74	358.50	
Jean	925	Ap'l 10. ...	Hol. " .	223	6,382	4.5	3.3	3.5	223.52	257.05	
Jennie	1,055	Mar. 1	Ayr. " .	275	5,730	3.8	3.0	3.24	186.04	213.94	(9 mo's.)
Lilly	943	Nov. 16	Jersey	299	5,455	6.2	3.4	5.5	302.46	347.83	
Lucy.........	1,045	Dec. 18, '98.	H. Grade...	335	7,012	3.8	2.9	3.48	244.31	280.95	2 yrs. old, 1st calf.
Margaret.....	1,576	Aug. 19	Holstein ...	270	9,128	4.2	2.8	3.45	315.66	363.00	
M. Cornelius..	.....	May 7	" ...	214	4,860	3.2	2.1	2.6	125.26	144.04	2 yrs. old, 1st calf (7 mo's).
Molly	1,195	Nov. 20, '98.	H. Grade ..	350	8,345	4.6	3.0	3.6	302.34	347.69	3 yrs. old, 1st calf.
Moss	1,041	May 26	J. " ..	308	6,208	6.4	3.7	4.65	289.15	332.52	
Megg.........	1,365	Ap'l 25.....	Holstein ...	214	7,145	4.6	2.8	3.3	236.98	272.52	
Nellie........	972	Nov. 4......	Grade......	282	5,334	4.4	3.1	3.9	209.07	240.43	
Ont. Belle....	986	Aug. 11	Jersey	320	4,490	6.8	4.0	5.7	255.77	294.13	
Patience	1,190	Ap'l 24.....	Ayrshire ...	266	7,273	5.2	3.0	3.68	268.26	308.49	
Polly	1,235	Dec. 31, '98.	Hol. Grade.	305	6,815	3.9	3.0	3.35	227.59	261.72	3 yrs. old, 1st calf.
R. Burnette ..	912	Feb. 26	Jersey	280	7,892	6.4	3.0	4.16	338.08	388 79	
Wedo	1,202	Oct. 4......	Holstein ...	291	8,707	3.6	2.0	3.1	273.94	315.03	

1. The largest producer of milk was a Holstein cow, which gave 9,128 lbs. during the year. The second largest producer was a Shorthorn grade, and the third was a Holstein, and the fourth a Holstein grade heifer, 3 years old, after first calf.

2. The largest butter-producer was a Jersey cow with a record of 398 lbs. of butter, which is 48 lbs. below her record for last year. The second was a Holstein, the third a Short-horn grade, the fourth a Jersey, and the fifth a Jersey grade. (Butter was calculated by adding 15 per cent. to milk fat.)

3. The percentage of fat from individual cow's milk varied from 2 to 6.8 in the weekly or monthly composite samples. The yearly average percentage of fat varied from 2.6 to 5.7.

4. The lowest production of butter by one cow for a full year was 178.65 lbs. Her record last year was 222 lbs. We shall dispense with her services at an early date, though she was bought for a "record-breaker."

5. The lowest yield of milk by one cow was 4,490 pounds, but this cow's milk averaged 5.7 per cent. fat, consequently her butter record is very fair.

6. The number of days during which the cows were milking varied from 214 to 355, Bella, an Ayrshire grade heifer having milked practically the whole year, though she is not doing so well at present as she would have done had she been dry six weeks to two months.

7. The live weight of the cows varied from 820 lbs. (an Ayrshire heifer registered in Appendix) to 1,576 lbs., the weight of a pure-bred Holstein, the cow which gave the largest quantity of milk. The live weight of the largest butter-producer is 912 lbs.

Milk Tests at the Fall Fairs.

I took charge of the milk tests at Toronto and Brantford Fairs. Mr. Stratton took charge at Straffordville and Aylmer Fairs. At Toronto, the awards were made to the cows producing the greatest weight of milk solids in 48 hours. At Brantford, Straffordville and Aylmer the prizes were awarded according to the Provincial Dairy Show scale of points (old scale). At Brantford the test was for 24 hours; and at the other two fairs, the time was but six hours, which is far too short to be satisfactory.

Toronto, Sept. 4 and 5, 1899. Test, 48 Hours.

Rank.	Name of Cow.	Breed.	Owner.	Lbs. milk in 48 hours.	Lbs. fat in 48 hours.	Lbs. solids in 48 hours.
1	Daisy Banks	Holstein ..	Rettie Bros., Norwich	126.5	3.064	13.994
2	Inka Sylvia	" ..	C. J. Gilroy, Glen Buell ...	128.5	3.373	13.507
3	Highland Cornelia.	" ..	Retty Bros	129.5	2.746	13.398
4	Queen de Kol 2nd..	" ..	G. W. Clemons, St. George.	120.25	2.939	12.632
5	Princess Lida 4th..	" ..	C. M. Keeler, Greenbush ..	116.00	2.821	12.530
6	Juanita	" ..	C. J. Gilroy.	111.50	2.750	12.226
7	Nellie Gray	Ayrshire ..	N. Dyment, Clappison.....	111.25	2.960	12.219

Brantford, Sept. 20th, 1899. Test, 24 Hours.

Rank.	Cows.	Owner.	Lbs. milk.	Lbs. fat.	Lbs. solids not fat.	Points scored.
1	Highland Cornelia .	Rettie Bros................	70.75	1.981	6.230	74.94
2	Daisy Banks	"	61	1.464	5.185	59.42
3	Jane	Jas. Britton	31	0.992	2.790	58.70
4	Nellie Gray	N. Dyment.................	53	1.431	4.369	58.02

Straffordville, Sept. 20th, 1899. Test, 6 Hours, 3 Cows.

1	Three cows.... ...	A. Jackson.................	24	0.978	2.207	160.48
	"	T. H. Mason...............	21	0.870	1.849	122.09
3	"	E. A. Garnham............	11.25	0.370	1.028	104.75

Straffordville, Sept. 20th, 1899. Test, 6 Hours, 1 Cow.

1	One cow	E. Jackson.................	10.25	0.358	0.902	57.21
2	"	S. Murphy.................	4.25	0.233	0.399	40.70
3	"	B. Snell	4.50	0.198	0.401	40.36
4	"	D. Spiece	6.25	0.193	0.560	35.45
5	"	E. A. Garnham	2.75	0.060	0.253	29.96

Aylmer, Sept. 22nd, 1899. Test, 6 Hours, 3 Cows.

1	Three cows........	Wm Pound...............	32.37	1.152	2.895	98.30
2	"	C. M. Clark	25.25	0.998	2.193	89.32
3	"	P. Abbott	24.25	0.907	2.198	88.63
4	"	C. M. Clark	18.37	0.768	1.597	83.14

Aylmer, Sept. 22nd, 1899. Test, 6 Hours, 1 Cow..

1	One cow	R. Bingman	8.12	0.324	0.748	30.1
2	"	P. Abbott	9.25	0.397	0.848	29.6
3	"	C. M. Clark	11.25	0.438	0.947	29.
4	"	D. McLennan	14.25	0.370	1.249	20.3

Testing Apparatus, Rennets, Cheese and Butter Colors, etc.

As usual, we have had numerous requests for tests of dairy apparatus and dairy supplies. We aim to comply with these so far as possible. We have tested the following with more or less satisfactory results : The Cumming's Churn, Cornett's Milk Agitator, Hydro-lactic Creamer, Wheeler Gravity Creamer, Swedish Cheese and Butter Colors, Swedish Rennet, Boyer's Rennet Powder, and Alderney Butter Color. As there has been considerable agitation during the past season in reference to "dilution creamers", we report the results of tests made with the Hydro-lactic and Wheeler in detail elsewhere. The Cornett Milk Agitator is a very ingenious device for stirring milk and preventing the cream from rising during the night.

We have also been using "Formalin" on our cheese for preventing mould and have found it quite satisfactory this season, although there has not been so much mould this year, as in other years, a fact due, no doubt, to the very dry season and cool nights. An ex-student of the College reports that he has used a strong brine on his cheese with satisfactory results in preventing mould.

Improvements of the Year.

Early in the season we thoroughly disinfected the cheese curing-rooms and had the nside painted. This was necessary as we found a few of our Dairy School cheese mottled ; and the mottling was no doubt caused by having had mottled cheese for experimenting purposes in the rooms. We should have a special curing room for cheese of this class.

In the month of June, a receiving room for milk delivered to our home dairy was built at the north side of the home dairy building. It serves the purpose of a room for aerating experiments and for holding the home dairy milk at nights.

In September, we enlarged the home dairy department by taking in the adjacent. lecture room, as our quarters were too small, especially for our regular college classes The instructions given to our college students has nct been satisfactory until the present year. We can now accomodate a class of 40 to 50 in the home dairy department alone. We have six makes of hand separators, hand and turbine Babcock testers, and four or five hand churns, together with butter workers, etc., so that we are able to give a very thorough course in practical farm dairy work, which supplements and illustrates the lectures to first year students. Second year students will take some home dairy work and will also take the special creamery course in December.

Our home dairy will also be the college creamery for the summer months, and is nearly as complete as we could wish.

Needs of the Dairy department.

1. An up to date refrigerator plant.
2. Dairy stables put in good repair.
3. Excellent specimens of the leading dairy breeds. We ought to have some of the best females that can be purchased.
4 Dairy buildings repainted outside.

All of which is respectfully submitted,

H. H. DEAN,

Professor of Dairy Husbandry.

Ontario Agricultural College,
Guelph, Dec. 30, 1899.

PART VIII.

PROFESSOR OF AGRICULTURE.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith my seventh annual report.

As a detailed statement of my work would not be of general interest, I shall restrict my report to summarizing some of our results in live stock experiments, with some additional observations under the heading of *Farm Superintendence.*

HEAVY, MEDIUM AND LIGHT MEAL RATIONS FOR FATTENING STEERS.

This experiment is the third of a series of experiments with different quantities of meal for fattening steers. Nine steers were divided into three groups, making three steers in each group. With the heavy ration group an effort was made to feed one pound of meal per day per hundred pounds live weight of the animals. They would not all eat this quantity, so they were kept as near the limit as was deemed safe. With the medium ration group, the aim was to feed about to two-thirds of a pound of meal per day per hundred pounds live weight of the animals. The steers in the light ration group were started on about one-third of a pound of meal per day per hundred pounds live weight, and this quantity was increased as deemed advisable. The method of feeding may be made clearer by means of a table, and the table given below shows approximately how the meal rations were increased.

Period.	Heavy ration. Meal per steer per day.	Medium ration. Meal per steer per day.	Light ration. Meal per steer per day.
	lb.	lb.	lb.
Dec. 6th to Jan. 3rd	10	8	4
Jan. 3rd " Feb. 1st	11	8	5
Feb. 1st " Mar. 1st	12	9	6
Mar. 1st " April 1st	12.5	9	8
Apr. 1st " May 23rd	12.5	9	9

The meal rations given in the table are merely approximations. The meal actually consumed by the heavy ration group amounted to nearly nine-tenths of a pound of meal per day for every hundred pounds of the average live weight of the animals throughout the feeding period. The medium ration group averaged two-thirds, and the light ration group slightly over one-half of a pound of meal per day for every hundred pounds of the average live weight of the animals throughout the feeding period.

The meal ration consisted of equal parts by weight of corn and oats.

The remainder of the ration consisted of mixed clover and timothy hay of poor quality and roots. The hay was cut and mixed with pulped roots a day in advance of feedings, in the proportion of twenty pounds of roots to fifteen pounds hay. All food was carefully weighed. The experiment lasted 168 days.

The foods were valued as follows: meal, $13; hay, $6; and roots $2 per ton. These valuations are purely arbitrary, but they serve as a basis of comparison, which is all that is required. Below is given a statement of the gains made by the steers and the cost of a pound of gain:

In 1899.

Heavy Ration	:	Average	daily gain,	1.77	lbs.	Cost	of 1	lb.	gain,	7.68c.
Medium "	:	"	"	" 1.74	"	"	"	"	"	7.22c.
Light "	:	"	"	" 1.62	"	"	"	"	"	7.21c.

For the sake of comparison, the average results of three experiments in three successive years, are given below :

In 1897, 1898, and 1899.

Heavy Ration :	Average daily gain,	1.75 lbs.	Cost of 1 lb. gain,	7.25c.
Medium " :	" " "	1.70 "	" " "	6.69c.
Light " :	" " "	1.61 "	" " "	6.53c.

Summary and Suggestions.

1. In each of three trials, covering a period of 216, 179, and 168 days respectively, a comparatively heavy ration gave larger but more expensive gains than those obtained with lighter rations.

2. In the average of three trials, the most economical gains were obtained by commencing with about one-third of a pound of meal per day per hundred pounds live weight of the animals, and gradually increasing as circumstances demanded.

3. In two of the trials the groups that made the most economical gains received, on an average, very little more than half a pound of meal per day per hundred pounds of their average live weight during the feeding period.

4. Other experimenters have shown that the cost of producing a pound of gain increases as the animals become fatter ; therefore a finished steer is fed at a loss. From this it would seem that, to feed economically, an effort must be made not to have the steers finished for any considerable time before they can be disposed of. No doubt the light ration obtained some of its advantage through more nearly meeting the conditions favoring economical feeding, as given above.

5. No fixed rules can be given regarding the rate of increase in the meal ration. Each feeder must be guided by his judgment, and what has been said regarding the methods employed in these experiments can be taken only as a general guide.

6. The more attention paid to making the coarse fodders palatable, the better the results obtained from a given quantity of meal.

7. The experiments described deal only with somewhat protracted feeding periods. Shorter feeding periods would no doubt call for a considerable modification of methods, and a more rapid increase in the meal ration.

Mangels vs. Sugar Beets for Milk Production.

In order to test the comparative value of mangels and sugar beets for milk production, two experiments, each with different cows, have been completed, the first of which was reported in last year's annual report.

In each trial four cows were used. After a week's preparatory feeding the rations were changed. Two of the cows were fed sixty pounds of sugar beets per cow per day for two weeks ; then they were fed sixty pounds of mangels per cow per day for two weeks. The other two cows were fed sixty pounds of mangels per cow per day during the first two weeks, and then changed to sixty pounds of sugar beets per cow per day during the next two weeks. Thus each cow was fed two weeks on sugar beets and two weeks on mangels. In addition to the roots the cows received a meal ration and what clover hay they would eat, each cow receiving like quantities of hay and meal.

In the first trial the four cows produced 1268 lbs. of milk on sugar beets, and 1275.5 lbs. of milk on mangels.

In the second trial the four cows produced 1230.25 lbs. of milk on sugar beets, and 1238.5 lbs. of milk on mangels.

1. In each experiment there is a slight difference in the total milk yield in favor of the mangels, amounting to 7.5 lbs. in one case, and 8.25 lbs. in the others, in the milk produced by four cows in two weeks.

2. In the first trial, cow No. 1 decreased in milk flow, and cow No. 2 increased in milk flow after being changed from sugar beets to mangels ; and both cows 3 and 4 decreased in milk flow after being changed from mangels to sugar beets. In the second trial, all the cows gave more milk during the second two weeks than during the first two, but the cows that were changed from sugar beets to mangels made a greater increase, on the whole, than those that were changed from mangels to sugar beets.

3. Everything considered, these experiments indicate that there is very little, if any, difference between mangels and sugar beets as foods for stimulating the flow of milk. It must be remembered, however, that these experiments have no bearing upon the relative value of these foods for maintaining life or producing fat.

Experiments with Pure Bred Swine.

Fig. 1. This hog gave a first-class side of bacon.

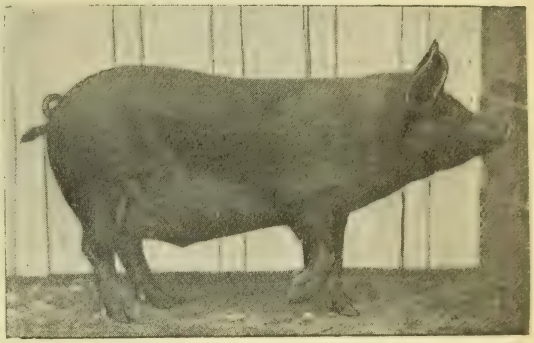


Fig. 2. A good bacon hog, but standing badly. Note, however, the high neck and jowl.

This experiment constitutes the fourth experiment in which representatives of six different breeds of swine were fed side by side. Six animals of each of the following breeds were used: Yorkshire, Tamworth, Berkshire, Chester White, Duroc Jersey, and Poland China. Each breed was divided into two lots of three hogs each. The experiment commenced June 13th, the hogs being at that time from 9 to 13 weeks old. Three hogs of each breed, 18 hogs in all, were fed equal parts by weight of corn and wheat middlings with skim milk. The remaining 18 hogs were fed equal parts by weight of barley and wheat middlings with skim milk. On August 10th, the meal mixture was changed to three parts grain to one part middlings by weight, corn still being used for one group and barley for the other. On September 1st, the skim milk was discontinued; and on September 15th, the middlings were dropped from the ration, the one group being fed pure corn and the other pure barley. The experiment was closed October 10th. On an average, about two pounds of skim milk to one pound of meal were fed during the time milk was used. The objects of these experiments were :

1. To compare the six breeds of swine :
   (*a*) With regard to economy of production.
   (*b*) With regard to suitability for the export bacon trade.
2. To compare corn with barley :
   (*a*) With regard to amount required for a pound of gain.
   (*b*) With regard to the quality of bacon produced.

Comparison of Breeds. In feeding the hogs, the animals were given a somewhat restricted amount of food, the aim being to keep them in good growing condition without developing an excessive amount of fat, though with some of the breeds it was a difficult matter to secure growth without too much fat. As stated before, considerable skim milk was fed, and in order to simplify comparison, the amount of dry matter in the foods has been estimated ; so that instead of giving the pounds of meal and milk required for a hundred pounds of gain, we give the pounds of dry matter which the meal and milk represent.

Food Required for 100 lb. Gain, Live Weight. In this year's experiment the amount of dry matter required to produce one hundred pounds of gain, live weight, for the different breeds were as follows : Berkshire, 318.28 lbs ; Tamworth, 331.16 lbs. ; Yorkshire, 334.85 lbs. ; Chester White, 336.68 lbs. ; Duroc Jersey, 337.1 lbs. ; Poland China, 349.99 lbs.

In this connection it will be of interest to note the standing of the different breeds with regard to economy of gain, in each of the four experiments which have been completed. The following table illustrates this point :

1896.	1897.	1898.	1899.
1. Berkshire.	1. Berkshire.	1. Yorkshire.	1. Berkshire.
2. Tamworth.	2. Tamworth.	2. Berkshire.	2. Tamworth.
3. Poland China.	3. Poland China.	3. Duroc Jersey.	3. Yorkshire.
4. Duroc Jersey.	4. Chester White.	4. { Tamworth. Chester White.	4. Chester White.
5. Chester White.	5. Yorkshire.		5. Duroc Jersey.
6. Yorkshire.	6. Duroc Jersey.	6. Poland China.	6. Poland China.

A glance at this table shows that the Berkshires and Tamworths have made a remarkable good showing with regard to economy of production ; but on the whole it would appear that economy of production is more influenced by the individuality of the animals than by the breed.

Suitability for Export. At the close of the experiment the hogs were shipped to the Wm. Davis Company, Limited, of Toronto, where they were slaughtered and the carcases examined. The results of the slaughter test were practically the same as those of previous years. The Yorkshires were the most uniform lot, possessing greater length between shoulder and ham, and carrying a more uniform depth of fat along the back than other breeds. The Tamworths stood second, being more irregular in size, length of side, and depth of fat along the back than the Yorkshires. The remaining breeds were generally unsatisfactory, being characterized by heavy jowls and shoulders, short sides, an extreme thickness of fat over the shoulder tops, and, in most cases, an excessive development of fat throughout. Probably the Berkshires might be placed next to the Tamworths, as they were a rather more uniform lot than the Chester Whites, Duroc Jerseys or Poland Chinas. The Poland Chinas were all extremely fat.

We give photographs of some of the hogs used in the breed experiment. The object in inserting these photographs is to illustrate types rather than breeds.

FIG. 3. A very good hog, but a little too fat.

FIG. 4. Too short and chubby. Note the short arched neck and heavy jowl.

Comparison of Corn and Barley. As before stated, half the pure-bred hogs were fed corn and the other half barley. In addition, some skim-milk and middlings were fed with the corn and barley, except during about a month, at the close of the experiment, when one group was fed corn alone and the other barley alone. Owing to the unfortunate occurrence described below, this part of the experiment was very unsatisfactory and requires repetition. It may be stated, however, that, during the time milk and middlings were fed, the hogs receiving corn made the most economical gains ; but after the milk and middlings were discontinued, the hogs receiving barley surpassed those on corn in rapidity and economy of gains.

FIG. 5. A very fair hog, but the shoulder proved somewhat heavy when the animal was slaughtered.

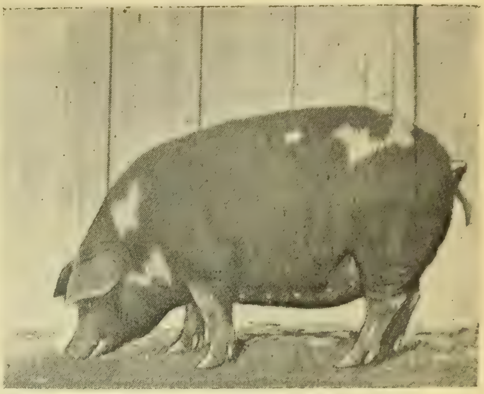


FIG. 6. Very short and fat. Too much belly. Compare with Fig. 1 in this respect.

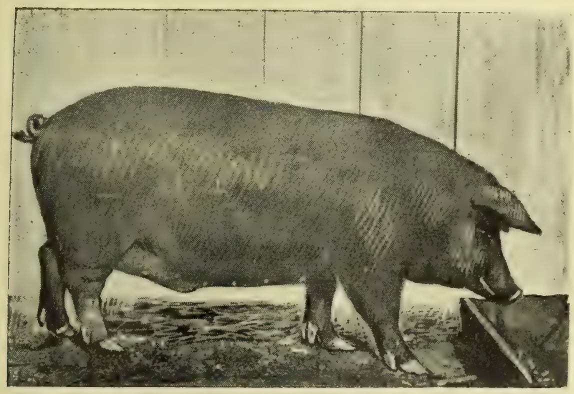


FIG. 7. A hog of fair length but entirely too fat. Compare the sagging, heavy belly with the trim belly shown in Fig. 1.

Quality of Bacon Produced. After the hogs were killed, the sides were all labelled, with the intention of having them salted separately, and examined for firmness when they came out of the salt. Owing to some misunderstanding or oversight on the part of the people connected with the factory, the sides were marketed without critical comparison after they came out of the salt. Thus the most valuable point in connection with the experiment was lost, and no part of it will be reported fully until further tests have been made. The sorter stated that some of the sides were firmer than the others, but none were rejected on account of softness. We have no record, however, as to which were the firmer. In the case of the Yorkshires and Tamworths, those fed corn were noticeably fatter than those fed barley. In the other breeds no marked difference could be detected.

Summary.

1. In each of four experiments the Yorkshires and Tamworths were pronounced by the packers more suitable for the export bacon trade than the representatives of other breeds.

2. Generally speaking, the results of four experiments indicate that economy of production is more dependent upon the individuality of animals than upon their breed.

3. The experiments indicate that it does not necessarily cost more to produce a pound of gain upon a hog of suitable bacon type than upon a hog of undesirable bacon type.

Experiments with Grade Swine.

On July 28th an experiment was commenced with grade swine, to test the value of several different rations both as regards economy of gain and the firmness of the bacon produced. Following is a a description of the plan of the experiment :

Group I., 11 hogs, average live weight at commencement, 63 lbs.

Ration : July 28th to Aug. 9th, equal parts by weight corn and middlings. Aug. 10th to Sep. 15th, 3 parts corn to 1 part middlings by weight. Sept. 16th to Oct. 10th, corn alone.

Group II., 11 hogs, average live weight at commencement, 62 lbs.

Ration : July 28th to Aug. 9th, equal parts by weight peas and middlings. Aug. 10th to Sep. 15th, 3 parts peas to 1 part middlings by weight. Sep. 16th to Oct. 10th, peas alone.

Group III., 13 hogs, average live weight at commencement, 63 lbs.

Ration : July 28th to Aug, 9th, equal parts by weight barley and middlings. Aug. 10th to Sep. 15th, 3 parts barley to 1 part middlings by weight. Sep. 16th to Oct. 10th, barley only.

Group IV., 14 hogs, average live weight at commencement, 61 lbs.

Ration : Same meal ration as Group III., except that hogs were fed only about two-thirds of the quantity given group III. In addition to the meal they were fed all the rape they would eat.

Results. Up to this period of the experiment the rate of gain and food consumed per 100 lbs. of gain were as follows :

Group I. (*Corn*) : Average daily gain per hog, .79 lbs ; meal consumed per 100 lbs. gain, 480 lbs.

Group II. (*Peas*) : Average daily gain per hog, .61 lbs ; meal consumed per 100 lbs. gain, 573 lbs.

Group III. (*Barley*) : Average daily gain per hog, .80 lbs ; meal consumed per 100 lbs. gain, 490 lbs.

Group IV. (*Barley and Rape*) : Average daily gain per hog, .84 lb.

Food consumed per 100 lbs gain, { Meal, 324 lbs. / Rape, 750 lbs.

While middlings were fed with the peas, Group II made very satisfactory gains ; but when the middlings were discontinued and clear pea meal fed, the pigs in this group did very badly. The method would not have been adopted only it was desired to test the effect of exclusive pea feeding upon the quality of bacon.

Rape gave very satisfactory results so far as economy of gain was concerned.

At the conclusion of this part of the experiment, the largest hogs in each group, about half the total number, were sent to the factory, along with the pure bred hogs, to be compared as to firmness of bacon. In this connection, however, they shared the same fate as the pure-breds, the bacon being marketed without critical examination when it came out of the salt, as was previously explained. While this was a very serious loss, it was not quite so disastrous as in the case of the pure-breds, because half the grade hogs had been retained for further feeding to make them heavy enough for export.

Second Part of Experiment.

The remaining hogs were kept in the same groups as before, and fed the same rations, with two slight modifications : the ration of Group II was changed back to 3 parts pea meal to 1 part middlings, and on Dec. 3rd rape feeding was discontinued for Group IV, the group being fed exclusively on barley from that date until the close of the experiment, a period 23 days The rations for the different groups, therefore, were as follows :

Group I : Corn.

Group II : Three parts pea meal and 1 part middlings, by weight.

Group III : Barley.

Group IV : Barley and rape until Dec. 3rd, then barley alone.

This part of the experiment lasted from Oct. 11th to Dec. 26th, or a period of 77 days.

Results. The average gain per hog, and the amount of food consumed per 100 lbs. of gain were as follows :

Group I (*Corn*) : Average daily gain per hog, .7 lb. Meal consumed per 100 lbs. gain, 547 lbs.

Group II (*Peas and Middlings*) : Average daily gain per hog, 1.12 lbs. Meal consumed per 100 lbs. gain, 455 lbs.

Group III (*Barley*) : Average daily gain per hog, 1.17 lbs. Meal consumed per hundred pounds gain, 456¾lbs.

Group IV (*Barley and Rape*) : Average daily gain per hog, .94 lb.

Food consumed per 100 lbs. gain $\begin{cases} \text{Meal, 440 lbs.} \\ \text{Rape, 764 "} \end{cases}$

The results just given do not correspond with those obtained during the first part of the experiment, and the fact that they do not is suggestive of several things. In the first part of the experiment, the corn group made the most satisfactory gains, but during this time the hogs in this group were fed pure corn for a comparatively short time. Those hogs of the corn group which were retained were fed pure corn during the whole of the second part of the experiment, and during this time they made the poorest gains of the four groups. This indicates that exclusive corn feeding for an extended period is poor economy.

Then, it has already been noted that the hogs in Group II did very badly when fed exclusively on pea meal. But during the second part of the experiment, when middlings had been added to the ration, they made the most economical gains of the four groups. This emphasizes the already pretty well known fact that to obtain the best results from peas, they must be mixed with other foods.

On the other hand, the hogs receiving barley did better during the second part of the experiment than during the first, indicating that barley is a very safe food for hogs.

Rape did not maintain its reputation during the second part of the experiment, but a good deal of the rape fed during this time was not of good quality,

At the close of the experiment the hogs were sent to the Wm. Davies Co. of Toronto, and below is given the report of Mr. J. W. Flavelle upon the bacon of the different groups, as it came out of the salt.

Mr. Flavelle's Report.

We have to-day examined the sides made from the hogs shipped to us by you, and upon which we understand you desire us to report.

Lot I (*Corn*) : Very soft, fat, pasty and greasy, in every way undesirable. The hogs in this lot seem to have thriven well on the feed as the sides are well finished, indeed quite fat.

Lot II (*Peas and Middlings*) : Excellent quality, firm.

Lot III. (*Barley*) : Very firm, probably the most distinctly hard and firm of any of the lots.

Lot IV. (*Barley and Rape*) : Good quality, firm with a slight tendency, but very slight, towards tenderness.

Summary.

1. Exclusive corn feeding during a somewhat extended period gave very unsatisfactory results in point of gain, and produced bacon of extremely soft, undesirable character,

2. The exclusive feeding of pea meal resulted in unthrifty animals and poor gains ; but a mixture of three parts pea meal and one part middlings by weight, gave good gains and produced bacon of excellent quality.

3. An exclusive ration of barley gave satisfactory gains, and produced exceptionally firm bacon.

4. A two-thirds ration of barley with all the rape the hogs would eat, followed by about three weeks' exclusive barley feeding at the close, gave economical gains on the whole, and produced bacon of good quality, though scarcely so firm as that produced by barley or by peas and middlings.

5. Barley appears to be an exceptionally safe and valuable food for swine, whether fed alone or in combination with other foods.
6. Peas should always be fed in combination with other foods, in which case they give good results.
7. Exclusive corn feeding is no doubt risky under any conditions, but the practice cannot be too strongly condemned when followed for any considerable length of time.

Experiments in Sheep Feeding.

Alfalfa and Red Clover Hay for Lambs.

Two short experiments have been made with these foods for lambs, the first of which is described in last year's report. In the first experiment, three groups of lambs were fed red clover, first cutting of alfalfa, and third cutting of alfalfa, respectively, together with a grain ration. In the second experiment, three groups of lambs were fed red clover, first cutting of alfalfa, and second cutting of alfalfa, respectively, without grain or any other food. The first experiment continued for 74 days, and the second for 42 days.

Summary.

1. In each experiment the alfalfa hay gave slightly better results than the red clover hay.
2. In the first experiment, the third cutting of alfalfa gave somewhat better results than the first cutting, but in the second experiment, the first and second cuttings of alfalfa were practically equal.
3. In the second experiment, one lamb in the red clover group made an extremely low gain, while the other lambs in the same group made an average gain equal to that of the alfalfa groups. This would indicate that the lower average gain on red clover was due to the individuality of this one lamb rather than to the food.
4. Everything considered, it cannot be said that either of the fodders showed marked superiority over the other. The experiments indicate that the feeding values of red clover and alfalfa hay are very similar.
5. All animals continued in perfect health from the beginning to the end of each experiment, indicating that alfalfa hay is a safe fodder for sheep, if it is cut and cured at the right stage of growth, say in early bloom.

Corn vs. Peas for Fattening Lambs.

During the winter of 1897-98, two groups of lambs were fed upon equal parts by weight of ground corn and oats, and equal parts by weight of ground peas and oats, respectively, together with clover hay. The results of this experiment are given in last year's report.

During the past winter, one group of lambs was fed ground corn, another fed ground peas, and a third group was fed equal parts by weight of ground corn and peas. All groups were fed like quantities of clover hay. The lambs were started on one pound of meal per lamb per day, which quantity was increased until it reached one and one-half pounds of meal per lamb per day. The experiment lasted 104 days.

Results. Briefly stated, the gains and meal consumed per pound of gain were as follows:

Corn Group: Average weekly gain per lamb, 2.52 lbs. Meal consumed per lb. of gain, 3.80 lb.

Peas Group: Average weekly gain per lamb, 2.91 lbs. Meal consumed per lb. of gain, 3.30 lbs.

Corn and Peas Group: Average weekly gain per lamb, 2.60 lbs. Meal consumed per lb. of gain, 3.68 lbs.

Summary.

1. In the first trial, corn and oats gave a larger gain than peas and oats.
2. In the second trial, peas alone gave the largest gain, followed by corn and peas.
3. The second trial is more satisfactory than the first because it covered a longer

period of time, and because, from the method of feeding, a more direct comparison of peas and corn was obtained. It is a suggestive fact that the gain made by the group on corn and peas is intermediate between the gains made by the other two groups.

4. During the second trial, ground corn could be bought for $17 per ton, while peas cost from 60c. to 66c. per bushel. As a result, though the peas gave the largest gain, the corn gave the cheapest gain.

5. According to the results of the second trial, if pea meal is valued at $20 per ton, ground corn would be worth $17.35 per ton.

Further tests will be made.

Farm Superintendence.

Upon the resignation of the former Farm Superintendent, Mr. Wm. Rennie, on October 1st I assumed control of this important department, in addition to my other duties, having for assistants Mr M. D. Geddes, as farm foreman, and Mr. W. J. Price, B.S.A., as Fellow in Agriculture. I am pleased to say that both these young men are doing excellent work.

Hauling in Hay on the College Farm.

Owing to the fact that I have had charge of the Farm department during only the last three months of the year, I cannot give anything like a full report of the year's work. The following is a brief statement of some points which may be of general interest :

The system of cultivation was the same as that followed during preceding years, which will be found described in previous reports of the Farm Superintendent.

The summer of 1899 was exceedingly dry, the total rainfall during the months of June, July, and August being less than two and three-quarter inches. As a result the crops were not so abundant as usual, and it is doubtful whether we shall have enough of all kinds of fodder for our rather heavy stock. The dry weather was particularly trying upon newly-seeded meadows, and it is quite probable that next year we shall have some very poor meadows as a result.

Live Stock.

Cattle.—Among the beef breeds we have representatives of the Shorthorn, Hereford, Aberdeen-Angus, Galloway, and Devon breeds. We are particularly in need of fresh Shorthorn blood. Among the milch cows kept in the department there are three Holsteins, one Ayrshire, and one Jersey, the remainder being grades.

During the winter of 1898-99, twenty-four steers were fed. In the fall of the present year, sixteen steers were purchased, and they are now in the farm stables.

Sheep.—Owing to the fact that the sheep have not done particularly well upon the College farm, the flock has been considerably reduced, representatives of only four breeds being retained, namely, Cotswolds, Leicesters, Oxfords and Shropshires. Should these prove successful, it is intended to increase the flock gradually. During the past summer, Lord Polworth kindly presented the College with three Border Leicester yearling ewes and a ram lamb. The ram, however, was unfortunately killed in an accident.

Swine.—Our swine represent three breeds, Yorkshire, Tamworth and Berkshire. Representatives of other breeds are fed in the experimental department. We have been somewhat overstocked with hogs this fall on account of the changed arrangements regarding the annual sale, as is subsequently explained. Private sales have not been very satisfactory, a fact due, no doubt, to the general depression in the price of hogs.

Methods of Feeding.

While there is, perhaps, no best ration for a given class of stock, an account of our methods of feeding may not be without interest. The following descriptions will give a fair idea of the methods we are practising at present, though they are subject to modification according to circumstances.

Beef Breeds of Cows.—The bulky part of the ration consists of cut hay, chaff, silage, and pulped roots. These foods are mixed a day in advance of feeding, in about the following proportions: Four bushels mixed cut hay and chaff, 5 bushels silage, and 3 bushels pulped roots. Of this mixture they receive what they will eat up clean three times a day. Cows suckling calves receive, in addition, a light meal ration, from 3 to 5 pounds, according as we deem advisable, though the quantities named do not necessarily represent cast-iron limits. Dry cows receive no meal. The meal mixture consists of 2 parts chopped oats to 1 part bran, by measure.

Milch Cows.—These receive the same bulky food and the same meal mixture at present as the beef cows. Cows giving in the neighborhood of 30 lbs. and upwards of milk per day are fed 10 lbs. per day of the meal mixture. Cows further advanced in lactation receive from 5 to 6 lbs. of meal per day.

Fattening Steers.—The steers are fed all they will eat, morning and night, of hay, silage, and root mixture. At noon they are given a light feed (about 6 lbs.) of long hay, by way of variety. Their meal consists of chopped corn and oats in the proportion of 5 parts corn to 4 parts oats, by weight. It is intended to increase considerably the proportion of corn in the mixture as the steers become used to it. In November the steers received about 4 lbs. of meal each per day, and in December 6 lbs. each per day. The quantity of meal will be increased as circumstances seem to demand, the aim being to have the quantity of meal average between one-half and two-thirds of a pound of meal per day for every hundred pounds of the average live weight of the animals. This method has given the most economical gains in our experiments with steers, a report which appears in Bulletin 110, published recently. The meal is fed by measure, but all grain is weighed in bulk before feeding, so that we shall know exactly how much meal the steer consumes during the fattening period. The same is true of the other classes of stock also.

Bulls.—Our stock bulls are fed hay, turnips, and a light meal ration. On an average they receive about half a bushel of turnips and 3 lbs. of meal each per day, the quantity of meal varying with the condition of the animals or the amount of service they have to perform. We find that a light meal ration and a somewhat limited bulky ration tends to keep the animals active. The meal consists of 4 parts chopped oats to 1 part bran, by measure.

Sheep.—The sheep are fed a mixture of cut hay and pulped turnips twice a day, with a feed of pea straw outside at noon. On an average they receive about 5 lbs. of turnips each per day, but this quantity will be reduced as lambing time approaches. In addition they receive a light meal ration, the quantity varying with the condition of the ewes. At present they average nearly 1 lb. per head per day of a mixture of 2 parts chopped oats to 1 part bran, by measure.

Swine.—In our piggery we have to feed a considerable amount of refuse from the College kitchen, a substance of varying composition and somewhat doubtful value. Our practice has been to cook this refuse, and to a barrel of it add about 70 lbs. of a meal mixture, composed of equal parts, by measure, of chopped barley, bran, and middlings. This mixture is fed to dry sows and hogs that have reached the age of about four months or over. The quantity varies with the condition of the animals, well grown animals usually receiving only two feeds per day, with roots at noon. Sows that are near farrowing or that are suckling pigs are not fed the refuse from the College, their ration consisting of chopped oats, bran and middlings, the oats constituting half the bulk of the ration. A few roots are fed by way of variety. To pigs just weaned we feed skim-milk, when ob-

tainable, with about two parts middlings to one of bran. A few roots are fed every day to accustom the pigs to eating them.

We are contemplating feeding more dry food during the winter months, and will report results at a later date.]

Financial Matters.

As the necessary data are not at my disposal, I shall not attempt to give a statement of the financial standing of the farm department this year. The general financial statement of the institution, however, does not represent the farm in its true light, since no account is taken of the produce and labor supplied to other departments. For example, we may mention the hay, silage, roots, pasture, and bull service for the large herd of cows kept in the dairy department; the hay and roots supplied the experimental department; the keep of horses for the garden and College departments; the potatoes and milk supplied to the College; the purchase and keep of extra animals for educational purposes; and a long list of services in the way of labor of men and teams for various departments, for all of which the Farm department does not receive a dollar of credit in the Public Accounts. In addition to the above, there are a few other points to which I desire to call attention.

In the first place, at a meeting of the Advisory Board, held late in September, it was decided not to have an auction sale but to dispose of the surplus stock by ordinary sale, as the amount available was hardly sufficient to warrant the extra expense necessary for an auction sale. This left us over-stocked with hogs which were disposed of as best we could in order to reduce our herd to the capacity of our winter quarters. A considerable amount of stock remains unsold at the time of writing this report. This statement of facts accounts for the very considerable shortage in the estimated revenue from the farm.

In the second place, I beg to state most emphatically that under existing conditions, it is impossible to make the farm show a satisfactory profit. It is true that by requiring all departments to pay the Farm department for everything received therefrom, the same as if purchased or hired from an outsider, the annual deficit shown in the public accounts could be greatly reduced. In order to make the farm show a profit, it would be necessary to set a portion of it apart, equip it with separate buildings, stock and implements, allow no other department to interfere with it, and have its accounts kept entirely separate from all others. But if this were done in accordance with the demands of some critics, and a profit shown from the land thus set apart, of what value would this be to the farmers of the Province? It would merely be demonstrating what is already being demonstrated on many well managed farms in this Province, that it is possible to make a profit from farming by pursuing a certain course. We find men making money out of dairying, out of fattening animals for market, out of breeding pure-bred stock of various kinds, and other lines of farming, as well as from all sorts of combinations of the lines mentioned. Now, who is to decide, or how is it to be decided what particular line or combination of lines of farming is to be adopted for this proposed model farm? Since it is a provincial institution, it is evident that any system which might be adopted must be applicable to the Province as a whole. There could be no excuse for following methods which, from their nature, would be incapable of general adoption. Is dairying to be followed? Then what about those whose taste, location, or investment of capital renders dairying out of the question? And would it be an unmixed good if all the farmers in the Province engaged in dairying? Are cattle to be purchased for feeding, and possibly grain purchased to feed them? Then who is to raise these cattle and grow the grain? Let everyone who has a plan to propose, apply it to the touchstone of general applicability, and see whether at best it would not only be a scheme to benefit a few at the expense of many.

There is still another side to this question. Select any successful farmer, and then vist his less successful neighbors and ask them why they do not adopt his methods, and you will probably receive such answers as these: "I have not the capital;" "I have not the business ability;" "I have no taste for that kind of farming, and would not engage in it;" "I have not the same natural advantages;" "I have not the reputation," etc. Now, if our model farm were in operation, we should hear another reason: "I have not

the Government at my back." Those who advocate a model farm to demonstrate how to make money, are exceedingly vague regarding the details of the scheme; and unless the scheme can be shown to be applicable to a great majority of the farms in the Province, what justification can there be for launching upon the enterprise?

People overlook the fact that science is applicable to all branches or lines of agriculture. It is as much for the day laborer working after hours in his small potato patch, as it is for the largest land owner in the Province. With this in mind, as well as the fact that a uniform system of farming throughout the Province is unattainable, if not undesirable, we are forced to the conclusion that if our College farm is to be of the greatest value to the Province as a whole, it must illustrate the application of advanced methods to as many phases of farm work as practicable. But this broadening of operations is a source of weakness financially, because no farmer could hope to make money if he divided his operations into as many channels as we are forced to do here. On the other hand, if the scope of our work were narrowed down to meet the requirements of a money-making concern, the number of people who could derive benefit from our operations would necessarily be very small. Take for example our students, to whom I believe we owe our first duty on account of the expense they are incurring to avail themselves of what we have to teach. It is argued that no better object lesson could be given them than a farm run upon a paying basis. Possibly this is true, provided that a system of farming were followed that each student could put into practice upon his return home. But, as a matter of fact, there is a very wide variation in the requirements of our students, and our present efforts are directed towards giving each man something that will be of use to him in his particular line. According to the proposed plan of having a farm run on some special line, probably not one-tenth of our students would find it possible to adopt a similar line of farming, and the remainder would leave here without receiving any real help towards solving the problems which they have to encounter on their own farms.

I have dwelt upon the above points somewhat at length, because I know that in taking upon myself the responsibility of conducting the Farm Department, I am assuming control of perhaps the most imperfectly understood and the most unfairly criticised department in connection with the institution. I think it important, therefore, that at the very commencement of my duties, I should make an effort to explain what appears to me the proper functions of the Farm Department, in opposition to proposals which are made from time to time regarding it. I may add that I have no hope of making the farm show a profit so long as present conditions exist. I shall endeavor to conduct the department with as much economy as is consistent with its efficiency, and an effort will be made to have the various operations of the farm represent advanced methods, so that our students, or others who are interested, may derive therefrom some hints which will be of service to them in directing the operations of their own farms.

Trusting that this defence of the Farm Department as it exists at present may not be regarded as out of place,

I have the honor to be,

Your obedient servant,

G. E. DAY.

Professor of Agriculture.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, December 30th, 1899.

PROFESSOR OF HORTICULTURE.

To the President of the Ontario Agricultural College :

SIR,—I have the honor to submit herewith my seventh annual report. In accordance with your request, it has been very much condensed and all tabular results of experiments have been excluded. These we hope to be able to publish in bulletins which will be prepared from time to time as sufficient valuable data are accumulated. The present report, therefore, is merely a brief summary of the work carried on in this department during the past year.

Teaching.—A full course of lectures, as outlined in the College circular, was given to the students of the first, second, and third years; and the studies taken up in lectures were supplemented by demonstration and practical work in the orchard, vineyard, small-fruit plantation, garden, greenhouse, and laboratory.

Outside Work.—The regular work of this department, apart from that of teaching, is of a varied character, and includes the care and management of: 1, Orchards; 2, Vineyard; 3, Small-fruit plantations; 4, Vegetable garden; 5, Lawn and grounds; 6, Forestry plantations; 7, Conservatory and greenhouses. In each of these much work has been done, and considerable progress has been made during the year. We shall refer briefly to such features of the work as may be of the most interest to the general public.

THE ORCHARD.

In the young orchard, set out in the spring of 1897, we have a large collection of varieties of apples, pears, plums, and cherries. And we are pleased to report that all of these, even the Japan plums—Burbank and Abundance—have so far come through the winters uninjured. In the spring of 1898, twenty trees each of quinces, peaches, and dwarf pears were set out. These were given a slight protection by wrapping them with straw. Some of the quinces and peaches were more or less killed back at the tops, while others and all of the dwarf pears came through uninjured. This was to us an agreeable surprise, when we took into account the severity of the past winter, which is generally considered the most disastrous that Ontario fruit-growers have yet experienced. There was little or no snow to protect the ground all winter, while the mercury often ranged from 15 to 30 degrees below zero for several days at a time. The ground in many places was frozen to a depth of from five to six feet. That such trees managed to survive with us, while thousands were killed out, root and branch, in the best fruit sections, is more than we could have expected.

THE VINEYARD.

In the young vineyard, set out in the spring of 1898, we were not so fortunate, as nearly 35 per cent. of the vines were winter killed. The varieties planted in this vineyard were selected from amongst the earliest and most likely to mature their fruit in this section. A count of the survivors this year shows that there is evidently a marked difference in the hardiness of the different varieties. We had about thirty-five vines of each of the following varieties. The list gives them in the order of hardiness, and shows the extent to which each suffered from winter killing:

	Per cent.	
1. Moore's Diamond.	2.6	winter killed.
2. Worden	5.3	"
3. Early Ohio......	7.8	"
4. Wyoming Red . .	7.8	"
5. Moore's Early....	10.5	"
6. Jessica..........	13.1	"
7. Brighton	34.2	"
8. Early Victor....	34.7	winter killed
9. Moyer	42.1	"
10. Lindley........	47.3	"
11. Massasoit	47.3	"
12. Delaware	68.4	"
13. Green Mountain.	70.9	"
14. Hartford	100.0	"

RASPBERRIES.

During the past three years we have been fruiting thirty-three varieties of raspberries, and careful records have been made of the yields from each variety. Among the reds, Columbian (purple), Shaffer (purple), and Cuthbert rank in the order mentioned for the heaviest yields during the past season. Highland Hardy and Marlboro rank first for earliness, giving the largest yields before the 15th of July. Golden Queen and London gave the largest late yields. These few varieties, including early, medium, and late, as well as those of red, purple, and golden color, would make a choice collection for either home use or market.

Among the black raspberries, Older, Gault, Eureka, and Hilborn, come in the order named for total weight of crop. Eureka holds the record for earliness, having given the largest yield before the 15th of July; while Mammoth Cluster and Gault made the largest late yields. The Palmer, which in 1897 held first place for total yield, dropped this year to sixth place on the list; and Gregg, which last year came third on the list, now stands tenth.

A new plantation of raspberries was set out last spring, containing about sixty varieties. And notwithstanding the exceedingly severe drouth of last summer the bushes have made remarkably fine growth. All of these varieties will in due time be thoroughly tested and reported upon.

BLACKBERRIES.

It has generally been considered that blackberries were too tender for sections of the country having a climate such as we have at Guelph. But after an experience of three years, including such a severe test as our bushes had last winter, we think we may safely say we have found some varieties which may be considered hardy, even at Guelph.

Eight varieties have now been fruited here, and among them Agawam, Western Triumph, and Stone's Hardy have so far come through the winters uninjured; and this year they rank in the order named for total weight of crop. Gainor, Ancient Briton, Taylor and even Snyder were more or less seriously winter-killed, and yielded in the order mentioned.

CURRANTS.

Currants are among the hardiest of our small fruits; and, with reasonable care, they may be expected to yield a good crop in all sections, and all seasons. As with other fruits, however, there is considerable difference in the productiveness of the different varieties. During the past three years we have been fruiting thirteen varieties, two white, eight red and three black. In all these years, the *White Grape* has held first place as a white currant, and until last year it had not been beaten in point of yield by any other variety, either red or black.

For first place among the red varieties there has been a number of strong competitors. In 1897 that place was held by Raby Castle, which this year stands fifth on the list. In 1898 it was held by North Star, which this year has dropped to seventh place. And in 1899 Fay's Prolific stands first, with an average yield of 54 oz. per bush, while Cherry follows with an average yield of 39 oz. per bush. But as *Fay's Prolific and Cherry* bear much larger and finer looking fruit than any of the others mentioned, they have an additional claim to consideration by the planter. Belle de St. Giles, a new variety which this year ranks fourth on our list for productiveness, also bears very large, handsome fruit, and is well worthy of trial.

For an average of the yields of the past three years, the *Champion* ranks first among the black currants; but it has not, on the whole, very much outyielded Naples and Lee's Prolific. And none of the blacks have borne anything like the crops given by the best red and white varieties.

GOOSEBERRIES.

There are two quite distinct classes of gooseberries grown in this country—*the American varieties*, which have been developed from the native wild gooseberries, and *the European varieties*, the plants of which are mostly imported from England. The American varieties are, as a rule, better suited to our climate, are more healthy and vigorous, and bear more heavily, although the fruit is not so large as that of the English varieties. The

great trouble with the English varieties, in this country, is that they are so subject to mildew that it is seldom we can get a good crop from them, unless they have been regularly and thoroughly sprayed with potassium sulphide.

During the past three years we have fruited thirteen of the varieties most commonly sold by Canadian nurserymen. Six of them were American varieties, and seven were English; and all of the former have each year yielded better than the latter. For each of the three years *Pearl* has headed the list in productiveness. The contest for second place has been between Downing, Red Jacket and Houghton, each of which have held this place for one year. Downing very closely resembles Pearl in appearance, but has never yet come quite up to it in productiveness.

Red Jacket is one of the most promising of the American varieties; and although it is of English parentage, it has not yet shown signs of mildew, the berries being quite as large as some of the leading English varieties.

Strawberries.

Two hundred and fifty varieties of strawberries have been fruited here during the past four years. Careful notes have been taken on the habit of plant, and the character of fruit of each variety, and every picking has been carefully weighed and recorded. We are in a position, therefore, to speak with some authority upon a large number of varieties, and particularly upon those that have been under test for four years in succession. It is impossible, however, to give a satisfactory report in such a brief summary as is here necessary, because of the many and varied qualities which have to be considered in arriving at a conclusion as to what is really the best early, medium and late strawberry. We hope soon to be able to prepare a bulletin on this subject in which a fuller report can be be given. Only a few of the leading varieties can be here mentioned. Among two hundred and seventeen varieties fruited this year, *Irene* heads the list for productiveness, while Stone's Early comes second, and Clyde third.

Irene is a comparatively new variety, which has been fruited here only two seasons. The plant is vigorous and healthy, and makes plenty of runners. The blossoms are pistillate; and the fruit begins to ripen about mid-season, and holds on well till late. The berries are of fairly good size, firm, shapely, and of a beautiful rich dark crimson color, with bright yellow seeds, and a varnished appearance. Irene is certainly one of the promising new varieties.

Stone's Early has been tested for the past four years, and during that time it has made the highest average for total weight of crop. It is something of the Haverland type, both in plant and berry, having all the excellent qualities of that reliable variety, but it also lacks the firmness necessary for a good shipper.

Clyde is one of the most promising of recent introductions, and has made a grand record for the two years it has been fruited here. The plant is vigorous and healthy, the flower perfect, and the berry is large and moderately firm, but the color is hardly so dark as we would like.

Saunders ranks second for productiveness among the varieties which have been tested for four years. It possesses as many of the good qualities and as few of the faults as any variety on the list. The plant is vigorous, free from rust, makes plenty of runners, has perfect blossoms, blooms late, and thus often escapes injury from late spring frosts. The berry is large, firm, well shaped, and of a good color. As an all-round late variety, Saunders has proved one of the best.

As to which is *the best early variety*, it is more difficult to decide, as there have been a number of strong contestants for that honor. For two years in succession Van Deman held first place for the largest early yield, but in the drouth of last summer it fell far behind several others. But as far as earliness and fine berries are concerned Van Deman is hard to beat, its worst fault is that the plant lacks vigor, and thus requires a favorable season to make a good yield.

Anna Kennedy gave the heaviest yearly yield this year, and is altogether a very handsome, promising variety, but we have not tested it long enough to know how it will hold out. If we were asked to make *a selection of half a dozen* of the leading varieties which would pretty well cover the season, we would from our present experience select Van Deman for earliness, Saunders for lateness, and Stone's Early, Irene, Clyde, and Tennessee Prolific for general crop.

Tomatoes.

In view of the growing importance of the tomato crop, not only for home use but for canning and export, we have for the past two years been conducting a variety test of tomatoes. This year thirty-seven varieties were included in the tests. Careful notes were made on all the important characteristics of each variety, and at each picking accurate records were made of the weight of sound ripe fruit, the rotten fruit, and of the green fruit left on the vines at the end of the season. In this way some very interesting and valuable data were obtained.

In the amount of unripe fruit at the end of the season, there was comparatively little difference in the different varieties; the lowest having an average of 1 lb. per plant, and the highest having only 2 lbs, 7 ozs. per plant. In the amount of rotted fruit there was a wide range; varieties such as Atlantic Prize, Aristocrat, Earliest of All, Dwarf Champion, and Early Ruby were comparatively free from rot, while a number of otherwise excellent varieties lost the greater part of their crop in this way. This might have been prevented to a large extent by spraying with the Bordeaux mixture, but they were left unsprayed in order to ascertain the susceptibility of each variety to the tomato rot fungus; and the results show that there is a very marked difference in this respect.

Taking into account the amount of sound ripe fruit for the whole season, we fine a wonderful difference in the productiveness of the various varieties. *Atlantic Prize*, stands at the head of the list, with an average yield of 77 lbs. 10 ozs. per plant, while the so-called "Best of All" stands at the bottom of the list, with an average yield of only 8 lbs. 7 ozs. per plant. The first dozen varieties in the order of their yields of sound ripe fruit were Atlantic Prize, Earliest of All, Stone, Mayflower, Aristocrat, Ponderosa, Ignotum, Livingstone's Beauty, Long Keeper, Trophy, Fordhook First, and Dwarf Champion.

In this year's as well as in last year's tests the first variety to give ripe fruit was *Earliest of All* (Steele-Briggs's). This variety has made for itself a good record, being not only very early but very productive. The fruit is of good size and color, but lacks somewhat in smoothness and firmness.

Atlantic Prize, may be considered one of the standards for earliness, and it is only a few days later than Earliest of All, while the fruit is smoother and firmer. In sections such as this, where the seasons are short, these early varieties have proved to be the most satisfactory for main crop.

For handsome, smooth, firm, well-colored fruit, *Stone* and *Aristocrat* were two of the best. The former was about a week later than the Earliest of All, and ranks third on the list for productiveness, with an average yield of 46 lbs. 10 ozs. per plant, although it lost 12 lbs. per plant by rot. Aristocrat was about two weeks later than Stone, and ranks fifth for productiveness, with an average yield of 38 lbs. per plant, and was free from rot.

Tests of Ornamentals.

Floriculture is a branch of horticulture to which more and more attention is being given as our country becomes older. Some evidence of this may be seen in the greater attention being given to annual flower shows, and the increased space devoted each year to ornamentals in the catalogues of seedsmen and nurserymen. From the glowing and two often exaggerated descriptions given in many of these catalogues, the novice is often altogether at a loss to know which really are the most satisfactory species or variety. Of course these are questions about which there may be a great variety of opinions, nevertheless the difficulty of selection would be considerably lessened, if these lengthy lists of varities could be reduced to say a score or two of the choicest.

For some time past we have been testing a great many varieties of a number of the most popular species of ornamentals, and a few of what we have found to be the most satisfactory are here given.

Geraniums.—For several years past, we have been testing a large number of varieties of geraniums for bedding purposes; and for the past two seasons, careful notes have been taken on 230 varieties, which have been grown under the same conditions in the green house and have been tested side by side in the flower border. This collection is

made up from stock secured from some of the leading growers on this continent. In the list given below only those varieties are mentioned which have scored the highest number of points for two years in succession :

Scarlet—Aceton, Director Marmy, Garden Director, General Grant, J. J. Harrison, Louis Fages, Marvel, M. A. Bouleaus, Marquis de Garland and W. A. Chalfant. *Crimson*—S. A. Nutt. *Rose*—Fanny Thorpe and La Constable. *Pink*—Eulalie, Madonna and Mary Hill. *Salmon*—Dr. Verneuil, John Good and Mrs. E. G. Hill. *White*—Alpine Beauty, C. de Harcourt, La Favorite and Mad. Buchner. *Silver-leaved*—Mad. Saleroi and Mrs. Parker. *Golden-leaved*—Crystal Palace Gem.

COLEUSES. —Probably none of the many plants used for bedding purposes make a greater color display of foliage than the coleus. To attempt to describe the coloring and markings in some of the varieties now grown would seem like presumption, yet, in addition to rich coloring a first-class bedding variety must have vigor and a free branching habit. During the past two years forty-five varieties have been tested side by side in our trial plots ; and while the colors have not been lost sight of, careful note has been taken of the vigor and habit of each variety. The following have been found to combine the greatest number of desirable qualities : Alhambra, Beckwith Gem, Chicago Bedder, Charming, Excelsior, Electric Light, Firecress, Firebrand, Golden Bedder, John Good, Pink Gem, Paroquet and Rob Roy.

CHRYSANTHEMUMS.—The chrysanthemum deservedly enjoys the distinction of being the "Queen of Autumn Flowers." It is a favorite not only with the professional, who grows it in all its perfection for the autumn shows, but with the amateur who delights in having bright and cheery flowers in the house at the Thanksgiving season.

To encourage its cultivation to a greater extent in the homes of the people, a commendable move was made last year by some of the local horticultural societies of the Province. In the spring, small collections of desirable varieties were given to the members ; and when the flowers were in bloom in the autumn, little chrysanthemum shows were held, when the beauties of the flowers were discussed and admired.

In order to assist any such societies as may make a similar effort next year, we give below a list, which may be considered the cream of about 250 varieties which we have tested for several years. This list includes not only representatives of most of the different types, but also a wide range of shades and colors.

Japanese—Autumn Glow, Georgina Pitcher, Harry Sunderbruch, Heron's Plume, Maud Dean, Mrs. W. H. Robinson, Mrs. L. Allan, O. P. Basset, Philadelphia, Pitcher and Manda, Queen, Viviand-Morels W. H. Lincoln and Waban. *Japanese Quilled*—Good Gracious, Helen Bloodgood, Iora, Kentucky, L. B. Bird and Mrs. W. H. Rand. *Japanese Hairy*—Beauty of Truro, Louis Boehmer, Leocadie Gentils, Mrs. Alpheus Hardy and R. M. Grey. *Chinese*—Cupid, Ideality, Mrs. L. C. Maderia, Mrs. Col. Goodman and Major Bonnaffon. *Anemone-flowered*—Antonius, Condor, Descartes, Falcion, John Bunyan, Madame Robt. Owen and Surprise. *Pompons*—Rose Travena, Golden Fleece and Black Douglas. *Single-flowered*—Eucharis and Framfield Beauty.

GLADIOLI.—The gladiolus is one of the summer bloomers deserving of much more general cultivation. It is so easily grown that anyone who can plant the corms in the spring may reap a rich reward in bloom during the latter part of the summer. The flowers present a wonderful variety of colors and markings, and are often quite as choice as the rich man's orchid. If the spikes are cut and put in water in the house, when the first few lower flowers open, the upper flowers will open in succession, and often last for a week. A collection of mixed unnamed varieties will often give lots of bloom and good satisfaction ; but if something choice is wanted, there is much more satisfaction with a good collection of named varieties. A large number have been grown here during the past three years, and in the following list we give a score of those that have been most admired. This list includes good representatives of the Gandavensis, Lemoinei, Nanceianus, and Childsi types, and should give a succession of bloom from the middle of July to the end of October ; Achanti, Diamant, Deuil de Carnot, Domino Rose, Dr. Bailly, Erie, E. V. Hallock, E. Souchet, Formosa, La Parisienne, La Perle, Massena, Magenta, M. de Vilmorin, Nakomis, Nezinscott, Pacha, P. Hariot, Princeton and Snow-white.

ONTARIO FRUITS FOR THE PARIS EXPOSITION.

During the summer this department had charge of the preparation of a collection of Ontario fruits for display at the Paris Exposition. This work began with the small fruits early in July, and continued until the last of the winter apples were received about the end of the year. Excellent samples of different kinds of fruits were received from all sections of the country, and after careful selections the best were put up in glass jars, in preservative fluids best suited to retain the natural color of the different fruits.

The collection when completed made a very fine display, and, if it reaches Paris in good condition, it should be a credit to the fruit industry of this Province. On each jar was placed a neat label, giving the name of the variety of fruit, and also the name and address of the grower. After a good deal of culling and selecting of the best, the collection as put up for shipment consisted of 613 jars, made up as follows: 139 jars of apples, 84 of pears, 30 of peaches, 93 of plums, 5 of quinces, 2 of apricots, 54 of grapes, 80 of raspberries, 14 of blackberries, 34 of gooseberries, 39 of currants, and 39 of cherries.

ACKNOWLEDGMENTS.

I beg to acknowledge with thanks the following donations to this department during the past year:

Roderick Cameron, Niagara Falls, Ont.—Some choice species of greenhouse plants.

Central Experimental Farm, Ottawa, Ont.—Collection of American plums, raspberries, strawberries and tricolor geraniums.

Robt. Marshall, Snelgrove, Ont.—Scions of Dutch Mignonne apple.

Chas. T. Ford, Stoke Canon, England.—Scions of Cornish Gilliflower.

E. Routledge, Clinton, Ont.—Plants or Ocean Wave and Lancashire Lad gooseberries.

S. C. Sunley, Guelph, Ont.—Plants of seedling strawberries.

Spramotor Co, London, Ont.—Spray pump.

A. E. Sherrington, Walkerton, Ont.—Plants of Superlative raspberry.

G. C. Caston, Craighurst, Ont.—Plants of Little's 44 strawberry.

A. H. Crosby, Markham, Ont.—Plants of seedling gooseberry.

E. Bromley, Barkerville, B. C.—Plants of B. C. blueberries.

Henry Gowling, Wandin Yallock, Victoria, Australia.—Strawberry plants.

S. Greenfield, Ottawa, Ont.—Cuttings of seedling currant.

S. Spillett, Nantyr, Ont.—Gooseberry plants.

My thanks are also due to the heads of other departments, who have rendered kindly assistance in various ways, and to the foremen and men of this department, who have faithfully contributed their share towards making the work of the year a success.

Respectfully submitted,

H. L. HUTT.
Professor of Horticulture.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, Dec. 30, 1899.

PART X.

BACTERIOLOGICAL DEPARTMENT.

To the President of the Ontario Agricultural College:

Sir,—In the absence of the Professor of Bacteriology, I venture to submit a brief report of some of the work done in the Department during 1899.

Roup in Fowl.

A considerable amount of work has been done in investigating the diseases known as roup, canker and distemper in fowls. Attacks of roup cause much loss and annoyance to poultry raisers, and it is seldom that one sees a number of any poultry journal which does not contain one or more inquiries about a cure for roup.

In the spring, several letters were sent by me to various poultrymen in Canada and to a few in the United States, in order to find out definitely the opinions of practical men on the subject. The results, however, were most disapppointing. Only two Canadian poultrymen answered the questions, but all letters sent to the Americans were most fully answered, and the writers requested that they might be furnished with any information obtained as a result of our work.

I may also say that I found it almost impossible to obtain diseased birds from poultrymen. In several cases known to me, birds have died from the disease or have been killed and buried; but I have not been able to obtain any information from the owners. They have simply expressed the hope that we would soon find some reliable remedy. It has, as a rule, been necessary to pay for diseased birds, even when they appeared to be almost dead, I must, however, thank Mr. Graham, the poultry manager at the College, for his assistance in obtaining roupy birds.

Roup is probably the most widely spread and destructive disease affecting domestic fowls. Hens, chickens, turkeys, pigeons and pheasants are affected. In some outbreaks the mortality is high; in others, there are no deaths.

Opinions differ as to the cause of roup, but by most poultrymen it is supposed to be due to exposure to draughts or cold. It is generally admitted that the disease is infectious, and, this being the case, we must look for some more substantial cause for it than draughts or cold; for we know that infectious diseases, both in animals and man, are the result of the growth of either vegetable or animal parasites in the body. Roup has been ascribed to the growth of various organisms, both animal and vegetable; in fact, it has been stated that there are three organisms which cause the symptoms usually found in connection with roup.

In my investigations I have discovered as yet only one organism which will produce a membrane in the throat of fowls similar to what is found in cases of roup. This is described in the paragraph at the end of this article. Another organism, a coccidium, has been found to be present in the tissues of diseased birds, but I cannot yet show that it is the cause of the disease, although certain writers have stated that some forms of roup are caused by a coccidium. Further investigation will no doubt throw more light upon the subject, and it is hoped that sufficient valuable material may be obtained to allow of the publication of a bulletin on the diseases of poultry.

My attention was directed to an article by H. A. Stevenson, M.D, published in the *Journal of Comparative Medicine*, July, 1898, in which he states that roup is "caused by a specific germ which appears to me to be identical with the Klebs-Löffler bacillus"; and again, "I believe roup and canker to be the same disease, a disease identical with diphtheria in man."

Now these statements, if borne out by experiment and found to be correct, would demand the most rigorous treatment of diseased birds; in fact, the disease would soon

occupy a place of importance as high as that now accorded to bovine tuberculosis; for Dr. Stevenson takes the position that diphtheria may be spread by roupy birds in exactly the same manner as tuberculosis is supposed to be spread by tuberculous cattle. But several questions occur. In the first place, does our experience of the occurrence of roup in fowls and diphtheria in the human being lead us to the conclusion that there is a probability of there being any connection between the two diseases? Is not diphtheria a disease which is more prevalent in towns and closely populated districts, where very few fowls are kept? Is not roup at certain seasons almost universally prevalent in some poultry yards in the country, where there may be hundreds of cases of the disease without a single case of diptheria among those who look after the birds and treat them from day to day? Has it ever been observed that poultry raisers are more frequently attacked with diphtheria than those who keep aloof from poultry yards?

I may say, in a word, that I have not been able to obtain any evidence in support of Dr. Stevenson's contention.

Statements have been made by European writers that outbreaks of diphtheria have been found to occur in men, while at the same time poultry kept in the buildings in which the men lived were suffering from roup. They, however, do not note whether the roup commenced before the diphtheria or *vice versa*; and they give no good reasons for supposing that the outbreaks were actually connected with each other. In fact it is stated that the cases referred to, of alleged transmission of chicken diphtheritis to man, are on examination found to be mere assumption—due to utter ignorance of veterinary pathology.

Although the writer of the article in the journal referred to has stated that he has isolated a bacillus identical with the Klebs-Loffler (diphtheria) bacillus, yet Loffler himself, n studying the disease, has not mentioned the presence of the bacillus, but describes a totally different organism as the supposed cause of roup.

More recent investigations[2] have failed to reveal the presence of the diphtheria bacillus, as also have those of J. Barlow, Rhode Island Report for 1898.

My own investigations have also failed to confirm Stevenson's statement. In fact it may be said that they have proved the absence of the diphtheria bacillus in a virulent form in the roupy membranes examined, and no organism was found which could be imagined to correspond in appearance or action with that of *bacillus diphtheriæ*. Inoculation experiments with pieces of fresh membrane practised on both guinea pigs and rabbits have given negative results, which could not have been the case had the diphtheria bacillus been present in a sufficiently virulent form to cause the growth of a membrane. Again, sections of the membrane and underlying tissue, although numbers have been made, not only show that the characteristic clumps of Klebs-Löffler bacilli are absent, but that the structure of the membrane differs entirely from that of the diphtheritic membrane formed in the human throat.

Stevenson states that, in his experiments, when rabbits were fed from the same vessel as a roupy bird, they became infected with the disease and died as the result; but experiments conducted here have entirely failed to corroborate this statement. Not only did rabbits live for weeks in coups with roupy birds without becoming affected, but a doe brought up a litter in a coop in which were kept the worst cases of roup procurable; and these rabbits, though drinking from a vessel used by roupy birds, which was uncleaned for weeks, and eating hay and roots which were in constant contact with the birds, never showed any symptoms of ill health.

That there is sometimes a germ resembling the Klebs-Löffler bacillus in birds, I admit, for I have obtained it in numbers from the throats of pigeons which were perfectly healthy before examination, and remained so afterwards.

A similar germ has been isolated from pigeons by Macfadyen and Hewlett (Brit. Med. Journal, p. 1357, 1899), who found them in large numbers in the throats of pigeons suffering from canker. They, however, demonstrated that the disease cannot be produced in healthy birds by inoculation with pure cultures of this germ, and have shown that it has no toxic effect upon mice and guinea pigs, such as that produced by inoculation with *bacillus diphtheriæ*. They, therefore, conclude that it is not the same organism.

1. Friedberger and Frohner, Vet. Path., p. 233. 2. Infectious Diseases of Poultry by V. A. Moore, Bureau of Animal Industry, Bulletin No. 8, Washington, 1895.

There is at present no evidence to show that roup is caused by the Klebs-Loffler bacillus. On the contrary, there is a considerable amount of evidence which tends to show that it is not. In fact it has not yet been shown conclusively that the disease is due to the presence of any bacillus whatever.

It is clearly stated by Friedberger and Frohner that there are at least three varieties of organisms causing diphtheritic or roupy symptoms in fowls, two of these being of animal origin, and the third surmised to be a germ, although no evidence other than the infectious nature of the disease bears out this supposition.

The widely varying symptoms of roup are, no doubt, responsible for the various names by which the different forms are known, and for the difference of opinion as to what constitutes roup and what canker, and whether distemper develops into canker, as if generally supposed to be the case, or whether they are entirely distinct diseases; and it is only by careful and sympathetic observations, which may extend over years, that the real facts can be ascertained.

Antidiphtheric Serum as a Cure for Roup.—I was requested to make some tests as to the value of diphtheria antitoxin as a remedy and preventive agent for roup, as advocated in Dr. Stevenson's article already mentioned.

The use of this serum has been suggested by certain investigators in Europe; but I am unable to find any accounts of its use there.

Different lots of serum were obtained from well-known and reliable firms, and there can be no doubt as to its antitoxic properties when used in cases of genuine diphtheria.

The birds experimented on all presented the characteristic symptoms of roup, as given by Dr. Stevenson, and, therefore, I infer that I worked with birds suffering from the same affection as were those he used, and which it seems were invariably cured by the injection of the serum. The dosage and method of injection, as advised, were closely followed, with, however, very different results.

In only one hen was there a recovery closely following the injection, and it is extremely doubtful whether this was due to the action of the serum or to the care given to the bird; because in all cases the birds had contracted the disease while kept in buildings so cold that some of them had their combs frozen. While being experimented with, they were kept in a room warmed with steam pipes, and received the best possible attention, which was frequently sufficient to bring about a rapid recovery without any treatment. Even if the serum treatment were successful, the expense would prohibit its use, except in the case of valuable birds.

The action of any serum depends upon the fact that it contains substances, elaborated in the body of the animal from which it is derived, which are antagonistic to the products of the disease germ against which it is used. Hence the application of antidiphtheric serum would naturally give favorabe results in roup if that disease were caused by the diphtheria germ, which I have already shown is not the case; and I may add that in testing the serum, attempts have, on several occasions, been made to infect hens with the diphtheria bacillus, but without success.

The serum was also tried as a preventive. Healthy birds were injected and placed with diseased birds, and almost invariably they contracted the disease. Those that did did not do so could not be considered to have been immunised by the injection, because they had for some time previously been exposed with infected birds without becoming diseased. I have found that birds may remain healthy when exposed to the disease for several weeks, or even months, and then suddenly show the characteristic membranes in the throat, with no other injurious symptoms, and continue to lay eggs or gain in weight as usual.

Aspergilliosis in Fowls.

During my work on roup, I obtained several birds said to be suffering from that disease, but which on examination proved to be affected with *Mycosis* or *Aspergilliosis*. That this is a common and little understood disease can be seen by reference to the inquiry columns of the various poultry journals, in which diseases are frequently described that have all the symptoms of Mycosis.

The symptoms are much the same as those of some forms of roup, and the two diseases may be concurrent. There is usually a wheezing and rattling in the throat, with elevated temperature; and patches of membrane appear in the mouth and throat

The birds become thin and weak, the breath having in many cases a most offensive odor; and death usually ensues; but I believe birds do recover, and I have known some to be affected for over a year, remaining to all outward appearance in good health, and at length die suddenly from suffocation.

On post mortem examination, the air sacks of the thorax, and in some bad cases in the other portions of the body, are found to contain a hard, cheesy mass, which in some instances has an exceedingly foul odor. In advanced stages the lungs may be affected and exhibit numerous dark patches containg a viscid semi-purulent substance, while the other organs are healthy. Membranes or exudations may be present in the mouth and throat and also in portions of the intestines.

Cause.—This disease is caused by the growth in the tissues of different varieties of Aspergilli, which are species of mould. The Mycelia of the mould penetrate in all directions through the tissues, causing irritation and an exudation of blood cells, which, with the dead tissue cells and the mycelia of the fungus, form the cheesy mass already mentioned; and these in many cases cause suffocation by pressure on the air vessels.

Prevention and Cure.—As the disease is spread by means of spores, of which there are two kinds, the only method of prevention is by getting rid of the spores; but as these fungi are able to grow and produce spores on dead organic matter, it is practically impossible to do this. It must, however, be remembered that diseased birds are themselves scattering the spores freely while alive. One case examined showed the fungus in the spore stage in large quantities in the mouth. Hence all badly affected birds should be immediately killed. No remedy is known; but it has been recommended to make the birds inhale tar vapor, which is done by putting a piece of red-hot iron into some tar and placing the bird in the vapor.

Starters for Cheese-makers and Butter-makers.

During the past season, commencing in May, pure culture starters have been sent out to various cheese and butter-makers, 58 in all having been asked for—44 for cheese-making and 14 for butter-making; and a large number of letters have been received from those who have used the starters, all reporting favorably as to their value In some establishments, they are now in constant use. In butter-making, it is only by using the same starter for all churnings that the full benefit is obtained, the object being to produce butter of a uniform flavor. As it is now an established fact that the flavor in buttter made from good cream is due to the action of certain species of bacteria, it is evident that if a pure culture is used for a few days and then discarded for a week or more the object is not attained; because, although the butter made from naturally soured cream may, in some instances, be superior to that from cream ripened with a pure culture, it will not be uniform in quality like that from the latter. It is well known that the very delicate flavor of the best butter is not retained for any considerable length of time; and as the market for the greater portion of our creamery butter is so situated that much time must elapse between the date at which it is made and that at which it is consumed, the few packages of good butter from the naturally soured cream will have lost some of their flavor and in all probability have deteriorated owing to the presence of undesirable organisms, while that made with the pure culture will have retained its comparatively good flavor.

Directions for propagation are sent with each starter. Nevertheless, inquiries on a few points have been made by makers, the most frequent being as to the length of time that a starter may be kept without propagation and still retain its good qualities.

Experiments have shown that when properly prepared and kept cool in a refrigerator, the starter will be efficacious even at the end of four months. No doubt, it would keep for a longer period; but it must be understood that the lactic organisms are unable to grow in milk if it contains too much acid. After the acidity has reached a certain point, it seems to weaken the germs. Hence it is found that a larger quantity of an old starter is required to ripen a given quantity of milk than if the starter were fresh. It is not advisable to use an old starter directly; a new one should be propagated from it, in order to allow the bacteria to regain strength and vigor. In regard to the difficulty of keeping the starter over Sunday without danger of deterioration, it may be stated that as the only harm to be expected is the excessive souring of the starter, it should be re-

membered that the souring is caused by the growth of germs, and that as this is influenced by the temperature, the natural course to pursue is to keep the starter can at a slightly lower temperature in all cases in which it has, from any cause, to be left for a couple of days. The starter is at its best when thickening, and before it is completely coagulated.

Another difficulty seems to be in the selection of a suitable milk for a starter. All milk for starters should be pasteurized. That process may be relied upon to destroy all growing organisms; but it will not affect the spores of other germs which may be present and will commence to grow as soon as the milk is cooled. It has, however, been found that, as a rule, the higher the acidity of the milk the more spores it contains; and that, on this account, the acidity of the milk may be taken as a guide for its suitability for use as a starter—the lower the acidity the more suitable the milk; but this must be taken only as a general guide, for it is quite possible to have a badly contaminated milk with a low percentage of acid.

One point to which far too little attention is paid is to the covering of the starter can. I have frequently seen milk left exposed to the air from the time it was heated till long after it had cooled down. In this way pasteurized milk becomes contaminated to an extent which depends upon the length of time it is exposed and the number of organisms present in the air. Mould spores are usually present in considerable numbers in the air around buildings; and although they are not harmful during the ripening process, they are very objectionable in the butter when it is made up into pound packages to be kept for any length of time. Hence the milk should be covered carefully as soon as it is pasteurized; it should also be stirred and the temperature taken from time to time. A lid with a hole in it to admit the handle of the stirrer should be procured. If the water in which the can is placed is slowly heated there may be no necessity for stirring, and the lid need be removed only for a few seconds when the temperature is taken.

A few extracts from letters written by cheese and butter-makers who have used the starter are given below:

Cheese. Nov. 23rd.—"I had several for cheese-making and got good results from their use generally, although sometimes I had bad success with some of them. I fancy the fault is in the milk not being what it should be to start with."—J. W. Fotheringham.

Butter. Nov. 21st.—"Enclosed find stamps for another . . . the last gave good satisfaction."—W. Bragg.

Butter. Oct. 18th.—"Some time ago we received a butter starter from you. This has given us very good results; so good, in fact, that, as it is about used out, we should like to have another one from the same culture."—J. H. G., Ottawa Experimental Farm.

Cheese. Sept. 30th.—"Have been using one of your pure culture starters for cheese for some time and am well pleased with the results."

Butter.—"We got a bottle of starter from you the latter part of May or 1st of June, and have used starter made from it ever since . . . The work you are doing is of great advantage to creameries and cheese factories, and should be made use of by them all."—St. Marys Creamery.

Cheese Curing.

It has been conclusively shown by Russell and Babcock that much of the change occurring in cheese during the process of ripening is due to the action of an unorganized ferment which they call gallactase. At the same time, they admit that the action of bacteria may also have a great influence upon the flavor and quality of the cheese.

It is well known that the temperature at which a cheese is cured affects both the rate of ripening and the quality of the cheese,—cheese cured at high temperatures ripening quickly and possessing a texture inferior to that of cheese cured at a lower temperature. The flavor of the latter is usually superior, and it does not deteriorate nearly so quickly as that of hot-cured cheese.

Bacteriological examinations were made, in order to ascertain what effect the temperature of the curing-room had upon the bacterial content of cheese, and if possible to find out whether differences in bacterial content corresponded with the differences in the ripening cheese, in texture, flavor, etc.

Four batches of cheese were examined, each consisting of three cheese made from the same curd but kept in curing rooms at different temperatures. Samples were taken every three days, but, as a rule, owing to the small size of the cheese, plugs could be taken from only one end of each cheese; and on this account samples could not be obtained for so long a period as was desired, without danger of boring too close to an old hole and so obtaining a sample which might be affected by the presence of moulds.

A well-marked difference in texture and flavor was apparent throughout the examination; and although the scores given by the expert judges do not show a very marked difference in the cheese cured at different temperatures, they cannot be accepted as representing the actual difference between the ripened cheese, because the scores were all made at the same time and obviously cannot be taken as sufficiently accurate for experimental purposes, since the cheese were at very different stages of ripeness. While the hot-cured cheese were perhaps quite ripe, the cooler cured cheese were not nearly ripe; and it is impossible to say what change the latter would have undergone in the period of several weeks required to ripen it equally with the former.

This difficulty is mentioned also by Lloyd in the Bath and West of England Society's Report for 1898-9, and he states that by ascertaining the acidity of the cheese and the soluble solids he was able to give definitely the period at which a cheese would become fully ripe, and beyond which it commenced to deteriorate. This method he has used to find out when the cheese is in the best condition for marketing, and has obtained satisfactory results by so doing. It was not possible, owing to lack of time, in the experiments conducted in this Laboratory to ascertain the soluble solids, but the acidity was found. It was found that there was a distinct instinct in the percentage of acids in the cheese as the ripening process proceeded, but it was not uniform. The amount of acid in the cheese examined showed that when at their maximum of quality they did not contain quite so high a per centage as did the English cheese according to Lloyd's work. Some standard sufficiently accurate for practical work may be found by making a sufficiently large number of acid determinations, and it is intended to continue work in this direction if possible.

The results of the bacteriological examination show that the cheese cured at a low temperature has a far larger bacterial content than one cured at a high temperature; although for a very short period, not extending over two or three days, the hot-cured cheese, often being in the curing room for about 7–10 days, showed a slightly higher bacterial content than the cool cheese. The germs continue to increase in the cool cheese for a very much longer period than in the hot cheese. At a certain period, soon after being placed in the curing room, the high temperature cheese contains for a very short time a slightly higher number of germs than one kept in a cool room.

Another interesting and probably important point, when considered in connection with the above results, is that the cheese made in the latter part of the season have a very much higher germ content than those made in the spring and summer. It is a well known fact that fall cheese are superior to those made earlier in the season; it is also indisputable that cheese cured at low temperatures are of better quality than if cured at high or ordinary temperatures. Now, in both the fall cheese and the cold-cured cheese, we find an enormous increase of bacteria over those made at other times and cured at higher temperatures; and it appears to be quite reasonable to assume that in all probability the improved quality in both cases is due to the action of these bacteria. If this is so, it is a strong point in favor of the addition of a starter. It is hoped that further experiments will throw light on this point.

It is difficult to account for certain of the differences in germ content and quality of the cheese. In three of the series, *p. coli* was present in fair numbers. This germ has always been credited with the production of bad flavor in milk and cheese, and an attempt was made to find out to what extent this was true in the cheese examined. The results in two of the series showed clearly that the number of coli germs in the cool cheese was very much greater than in the high temperature cheese; but at the same time the flavor of the cool cheese was more pleasant than that of the other. This peculiarity may, however, be due to another cause, viz., the action of liquifying bacteria, *i. e.*, bacteria which peptonise and break down the casein. These germs were found to be more numerous and to increase more rapidly in the cheese kept at a high temperature; and as they are found to produce a disagreeable taint in milk, it is probable that they do so in cheese.

Bitter Milk.

During the summer a considerable loss in value of cheese was due to a trouble which was known as "Bitter Milk", and samples of cheese so affected were secured from four factories. The trouble occurred at various times from the latter part of July to well on in September; it was widely spread, and was prevalent in most of the factories of the district.

I had no opportunity to investigate the origin of the trouble nor to determine in what manner it had become so widely spread. The following is a description of the unusual changes met with in such milk, and was given by a maker at one of the affected factories:

"This bitter flavor cannot be detected in either the milk or the curd till acid begins th develop. The acid comes on very rapidly after it starts, and it is almost impossible to get the curd dry enough before matting, and does not altogether leave the curd before salting; but if it is handled properly it does not seem to affect the cheese when cured. At times we will not have any of this flavor for days or weeks, and then for two or three days we will have it quite acid, and all at once it will disappear again."

Other makers evidently have not discovered the "proper way" of treating this bitter curd, for many complained that they were obtaining a lower price for the cheese from such milk.

The first sample was obtained on August 8th. An analysis was made, and milk was inoculated with the various organisms found. Only one of these appeared to cause any undesirable change, and a starter was made by using it with a culture of the lactic acid germ present. Curd made with this starter was said (by a dairyman who had visited the factory) to possess a peculiar flavor. In the College cheese-maker's report, the cheese is said to have an apple flavor, which, of course, refers to the aroma, not to the taste.

The next samples were not received till two months later, but the same organism was isolated and a starter made from it which produced the characteristic peculiarities during the process of cheese-making.

The organism which causes the bitter flavor is a yeast-like form known as the Torula.

Torulas of various species are frequently met with in the air and also in cheese; but, as a rule, their presence does not cause any objectionable flavor.

The Torula isolated from the bitter cheese acts on the milk sugar, setting up a most vigorous and lasting fermentation, the sugar being converted into alcohol and carbon dioxide gas. When fermentation is completed, the milk contains fully as large a percentage of alcohol as the strongest beers; the bitter flavor, however, is noticeable before there is any distinct flavor of alcohol, and in cheese-making the smell of the alcohol does not appear until the curd is almost ready to mill.

It is interesting to note that what O'Callagan describes as a yeast (though he makes no mention of experiments to show whether it is a yeast or a Torula) frequently occurs in cream in New South Wales (New South Wales *Agr. Gazette*, Aug. 1899), giving it a sharp, bitter taste and forming alcohol. He also states that it would be injurious to butter-makers, and still more so to cheese-makers.

The Torula found in the Ontario cheese also produces a vigorous fermentation in other sugars, glucose, dextrose, and cane sugar undergoing this change and producing a clear, fermented liquid.

The source of this Torula, as already stated, has not been ascertained, and its intermittent appearance renders it extremely difficult to offer suggestions as to its exclusion from milk. If there be a reappearance of the trouble next summer, it is to be hoped that opportunity will be given for further investigation.

Experiments made to learn the effect ot a lactic acid germ on bitter milk, have shown that the curd in such cases is just as bitter as when no starter is used. Very little gas is formed in either case.

Water Analysis.

Twenty nine samples of water have been examined bacteriologically and reported upon during the past year; and by the two departments, the Chemical and Bacteriological, twenty-seven samples have been analysed in order to ascertain their suitability for domestic and other purposes.

Two samples were sent for examination from cheese factories, in which the makers had experienced much trouble from gassy curd. In one case, a piece of the cheese was sent and on examination was found to contain a gas producing germ, which was present in large numbers in the water. In the second case, the water was also found to contain large numbers of gas-producing germs, but of a different species from that found in the former case. The makers in both factories were informed of the presence of the gas germs in the water and were advised to discontue its use. Both have reported that since doing so, they have had no trouble with gassy curd.

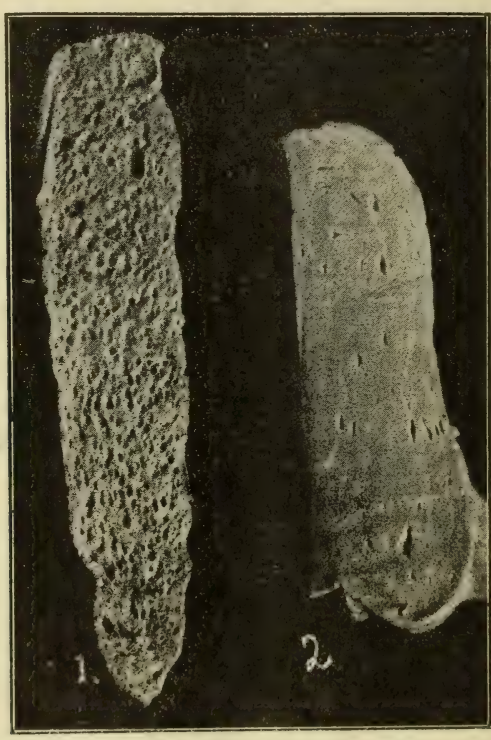


Fig No. 1—Curd made from vat No. 1.
Fig No. 2—Curd made from vat No. 2.

In connection with the second case, some experiments were made to ascertain what effect the addition of a pure culture would have on the progress of the gas formation, and the illustration in connection represents the appearance of pieces of the curd which were made from two vats of milk, numbers 1 and 2. To each of these an equal quantity of the gassy germ was added and at the same time to vat number 2 was added one per cent of a pure culture starter. The effect of this is well illustrated and clearly shows what a powerful influence lactic acid germs (the only germ in the pure culture) have over many undesirable forms found in milk.

Ontario Agricultural College,
Guelph, December 30th, 1899.

MALCOLM N. ROSS,
Fellow in Bacteriology.

[Mr. Ross's report does not deal with the manufacture and distribution of Tuberculin during the year, and is not so complete on one or two other points as he would have made it, had he not, during the time of its preparation, suddenly decided to enlist and start for South Africa.—President.]

PART XI.

EXPERIMENTALIST.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of submitting herewith my report of the work done in the Experimental department during the year 1899. The work of this department during the past year has on the whole been quite satisfactory. The experiments throughout have been conducted with great care and accuracy. We submit the results with much confidence in their reliability and in their real practical value. The writer has good reason to believe that the work of the Experimental department is being appreciated by farmers of the Province, and that the results are being studied more and more each succeeding year:

In 1899, we conducted field experiments on about 2,300 separate plots in our experimental grounds. We also furnished material and instructions for experiments on 21,035 plots situated on 3,485 Ontario farms. For the results of the co-operative experiments, the reader is referred to the Annual Report of the Ontario Agricultural and Experimental Union. The correspondence during the past year has been heavier than ever before. For several weeks in succession we have received upwards of one hundred letters daily. Addresses have been delivered by the writer at the Fourth Annual Meeting of the Agricultural Students' Union at the Ohio University; at the Annual Meeting of the State Board of Agriculture at Columbus, Ohio; at two sessions of the Annual Meeting of the Ontario Agricultural and Experimental Union, and at several meetings of the Farmers' Institutes in the western part of Ontario. About fifty talks of from thirty minutes to two hours were also given in the month of June, when about thirty thousand excursionists visited our experimental grounds. It will, therefore, be seen that the past year has been a very busy one for those connected with the Experimental department.

For several years in succession we have been conducting experiments with a considerable number of special crops; some of which are not very well known over the Province. We are here presenting a fuller report of these special crops than on any previous occasion, and are saying but little on our experiments in methods of cultivation, dates of seeding, selection of seed, application of fertilizers, etc., which can be dealt with more fully in another year after the experiments have been again repeated.

The experimental grounds consist of about forty-five acres, and are located in the rear of the main college building. The land has a gentle slope towards the south-west. The soil is what might be termed an average clay loam. One-quarter of the land is manured each year with about fourteen good loads (20 tons) of farm yard manure per acre. It will thus be seen that the land receives farm yard manure once every four years. No commercial fertilizers are used except in distinct fertilizer experiments, which occupy from two to three acres each year, and on which tests are made to ascertain the comparative value of different fertilizers with different crops. The plots vary in size according to the requirements of the different experiments, and the yields per acre are determined from the actual yields of the plots in every instance.

OATS (*Avena Sativa*).

As in the case of other cereals, the early history of oats is enveloped in mystery. They have been grown so long in cultivation, with no distinct records to guide us to their original country, that it still remains unknown. The wide range of soils on which oats grow to advantage, and the comparatively low temperature in which they come to their maturity, have rendered them well adapted for cultivation in many countries. In Scotland, we find oats cultivated to its northern extremity, and in Norway they grow as far north as lat. 65°.

The area devoted to oats in Ontario annually, is greater than that used for all the other cereals combined. In 1899, no less than 2,363,778 acres were devoted to the cultivation of oats in this Province.

Our Experiment Station has spared no pains in conducting experiments with different varieties of oats, to ascertain the most suitable kinds for cultivation throughout the Province. No less than two hundred and eighteen varieties in all have been grown on uniform plots in our experimental grounds within the past thirteen years. The greater number of these have now been grown for five years in succession and definite data have been obtained each year regarding the height of the plants, the strength of straw, the susceptibility to rust, the yield of grain, the yield of straw, the weight per measured bushel, etc., of each variety. Seed of promising varieties has been imported from England, Scotland, Russia, Germany, France, New Zealand, and many other countries, and the foreign varieties have been tested under similar conditions with all our Canadian varieties.

The following list gives the weight per measured bushel, tons of straw per acre, and bushels of grain per acre of each of seventeen of the leading varieties grown for a period of nine years—the figures in every instance being the average of nine years' results.

No.	Varieties.	Pounds per measured bushel.	Tons of straw per acre.	Bushels of grain per acre.
1	Joanette Black	35.6	2.8	89.3
2	White Siberian	34.2	2.6	86.3
3	Oderbrucker	31.5	2.5	82.6
4	Waterloo	31.9	2.5	82.2
5	Vick's American Banner	31.4	2.3	81.9
6	Probsteier	32.8	2.3	81.3
7	White Schonen	32.7	2.2	81.2
8	Bavarian	31.4	2.8	81.0
9	Poland White	36 5	2.7	80.9
10	Improved Besthorne	33.0	2.3	80.0
11	Danebrog	33.0	2 4	79.5
12	Holstein Prolific	32.4	2.2	78.5
13	Wide Awake	33.6	2.3	77 2
14	White Egyptian	35.9	2.7	73.8
15	Early Gothland	36.2	2.3	67.4
16	Clydesdale	38.8	2.4	66.3
17	Black Tartarian	30.7	2.4	65.6

These seventeen varieties have given the best results among one hundred and twenty-nine different varieties.

The *Joanette*, which stands at the head of the list in yield of grain per acre, is a black oat which was imported from France in the spring of 1889. It possesses a very short straw, and is suitable only for sowing on land which naturally produces a large amount of straw. As this variety stools abundantly there is great danger of using too much seed. Four pecks per acre is usually quite sufficient. As the grain is apt to shell if allowed to become thoroughly ripe, it is best to cut while the crop is somewhat green. The crop should be bound in small sheaves, as the straw is fine and large sheaves are too slow in drying. The grain of the Joanette oats is of excellent quality, as it is one of the thinnest hulled varieties in cultivation. The thinness of the hull, however, makes it necessary to use caution in threshing the crop, in order to prevent a large amount of the seed from being hulled in passing through the separator. All things considered, the Joanette is an excellent variety of oats for some farms in Ontario and a very poor one for others. The *White Siberian*, which comes second in the list in average yield of grain per acre, was imported by the College from Russia in the spring of 1889, and has given excellent satisfaction. It produces a long straw, and is well suited for medium to poor soil. The grain is white in color and of excellent quality. A committee appointed by the Oatmeal Millers' Association of Ontario examined eighty-one varieties of oats a few years ago, and pronounced the White Siberian a variety well adapted for the manufacture of oatmeal. Not only has it given excellent results in the experimental plots, but it is now grown almost exclusively, and with very satisfactory results, in large fields on the College farm. It has made the highest record of all the varieties of oats sent out over Ontario for co-operative experiments within the past seven years. It is now grown

extensively by Ontario farmers ; in fact, it is one of the most popular oats in Ontario at the present time. It is also interesting to know that all the Siberian oats which are now grown in Ontario originated from $\frac{3}{4}$ of a pound of seed which were sown in our experimental grounds in the spring of 1889 The *Oderbrucker* variety, which comes third in point of yield per acre, was imported by the College from Germany. It is also a white oat of good quality. The straw, however, is not so stiff as that produced by the Siberian variety, and the grain weighs somewhat less per measured bushel. The *Vick's American Banner* has been a very popular oat in Ontario. It will be seen, however, that the Siberian variety has given an average of about $4\frac{1}{2}$ bushels of grain per acre more than that produced by the American Banner from the average results of the two varieties grown side by side for nine years in succession. It will also be observed that the grain of the Siberian oats weighs nearly three pounds per measured bushel more than that of the American Banner.

Among the varieties which have been grown for a shorter length of time than those given in the above list, we would specially speak of the *Peerless*, *Improved American*, *Daubeney* and *Early Blossom* as among those which have made the highest records. The *Daubeney* is the earliest oat which we have ever grown in our trial grounds. The grain is white and the straw is of medium length. The variety is now grown by several farmers in Ontario, and can be used to advantage in mixing with peas or barley for the production of green fodder or of grain.

Winter Wheat and Spring Wheat.

The wheat plant appears to have been known and valued from the earliest times. As it will thrive successfully in a great range of climate, the inhabitants of many countries enjoy the advantages of its cultivation. There are, in all, seven distinct types of wheat, and to one or the other of these types all varieties belong. The seven types are as follows: 1, the common, fine, or soft wheat (*Triticum sativum*), 2, turgid or toulard (*T. turgidum*), 3, hard or flinty wheat (*T. durum*), 4, Polish wheat (*T. polonicum*), 5, spelt (*T. spelta*), 6, starch wheat (*T. amyleum*), and 7, one-rowed wheat (*T. monococcum*). Nearly all the varieties of both spring and winter wheat which are grown in Ontario belong to type No. 1, the common wheat (*Triticum sativum*), although representatives of all the different classes have been grown in our experimental grounds. Some of the best known representatives of other types are as follows: Wild Goose spring wheat, Medeah spring wheat, Algiers spring wheat, Poland spring wheat, Miracle winter wheat, etc. For the sake of convenience, we have arranged our wheats for this report under three heads, namely: 1, winter wheat; 2, spring wheat with hollow straw, and 3, spring wheat with solid or semi-solid straw. All the varieties of classes No. 1 and No. 2 belong to the common wheat (*Triticum sativum*).

Winter Wheat.—In the autumn of 1898, eighty-seven varieties of winter wheat were sown on plots uniform in size and shape. The land on which these varieties were sown was quite elevated and had a general slope towards the west, and was in one of the most exposed positions possible, as it thus got the full sweep of the cold winds from the west. The snow did not remain on the plots in any large quantities; and, as there were no fences or obstructions near the plots, the snow was very evenly distributed over the entire surface devoted to the experiment. It will be remembered that the winter of 1898-9 was one of the severest for wheat of any for many years past. Hundreds of acres which made an excellent showing in the autumn were plowed up in the spring, owing to the wheat being so badly killed out. On examining our plots in the spring, we found that the wheat was very badly killed, but that some varieties had come through the winter much better than others. As this test was a fair one, a knowledge of the manner in which the different varieties came through the winter furnished valuable information regarding the relative hardiness of the wheats. Those varieties which came through the winter the best are given below, and they are arranged in order of merit starting with the best: 1, Tasmania Red; 2, Red Velvet Chaff: 3, Red Wonder; 4, Prize Taker; 5, Standard; 9, Soules; 7, Siberian; 8, Dawson's Golden Chaff; 9, Pride of Genesee, and 10, Early Arcadian. The varieties which were almost entirely destroyed were; 1, German Emperor; 2, Harvest King; 3, World's Fair; 4, Mealy; 5, Golden Drop; 6, Rudy; 7,

Poole; and 8, Diamond Grit. The Early Genesee Giant, Early Red Clawson, American Bronze, Treadwell, Longberry No. 1, etc, occupied an intermediate place in regard to hardiness.

In connection with the above, it may be well to give a summary of the results of our experiments with winter wheat in former years, as follows:—

1. The average results of winter wheat growing on the experimental plots for nine nine years in succession are as follows: Weight of grain per measured bushel, 60 2 lbs.; yield of straw per acre, 2 07 tons; and yield of grain per acre, 39.5 bushels.

2. *Dawson's Golden Chaff* has given the largest average yield of grain per acre among seventy varieties of winter wheat grown at the Ontario Agricultural College for five years; also among eleven leading varieties tested over Ontario in 1893, nine varieties in 1894, 1895 and 1896, and seven varieties in 1897, 1898 and 1899.

3. The *Early Genesee Giant* variety of winter wheat is a close rival of the Dawson's Golden Chaff variety in the small plots in the Experimental department and in the large fields in the farm department of the Agricultural College, and also in the co-operative experiments conducted throughout Ontario.

4. Winter wheat which did not lodge until cut, produced a crop more than double the value of that which became lodged before it was ripe.

5. In five years' experiments with varieties of winter wheat, the American Bronze, Dawson's Golden Chaff, and Early Genesee Giant varieties possessed the stiffest straw of all the large yielders of grain.

6. Large plump kernels of winter wheat gave much better results than those which were small, plump, shrunken or broken.

7. In the average of six years' experiments in sowing winter wheat at different dates, it was found that when the wheat was sown later than September 9th, the crop was usually much poorer than when the seeding took place on or before that date.

8. As a crop to plow under for green manure in preparation for winter wheat, peas have given the best and buckwheat the poorest results.

9. In an experiment in cutting winter wheat at different stages of maturity for several years in succession, it was found that the largest yield of grain and the best quality of seed were obtained from the crop which was allowed to ripen fully before cutting.

10. Winter wheat, badly infested with "stinking smut," has been very effectually treated three different years by the use of either copper sulphate or hot water.

Spring Wheat.

We have grown one hundred and thirty-eight varieties of spring wheat within the past eleven years. The greater number of these varieties belong to the common or fine wheats (*Triticum sativum*). In the spring of the present year, thirty varieties of common spring wheat were sown. Of this number, the Welland Fife, New York, Red Fife, Lost Nation, Champion Bearded, Preston and Amethyst produced the largest yield of grain per acre.

In averaging the results of all the varieties of common spring wheat which we have grown under similar conditions for seven years, we find that sixteen varieties have given an average of upwards of 25 bushels each per acre. The following table gives the average of the results for the seven years.

The *Red Fife*, which stands at the head of the list in yield of grain per acre, is the old standard wheat well known in Ontario and Manitoba. The *Herison Bearded* variety, which comes second on the list, was imported from France in the spring of 1889. Although it has given an average of one-half bushel per acre less than the Red Fife, it will be observed that the grain weighs nearly three pounds per measured bushel more than that of the Red Fife variety. A committee appointed by the Dominion Millers' Association of Ontario examined fifty-seven varieties of spring wheat and pronounced the Herison Bearded a first-class milling variety. It grows a medium length of straw, which usually stands upwell. The head is very short and compact and is bearded. The variety which comes fourth in the list, namely, the *Wellman Fife*, is a wheat which is grown quite largely in some of the North-Western States of the American Union, and is prized very highly. It has made an excellent record in the co-operative experiments over Ontario, occupying first

place in yield per acre among the three varieties sent out and tested on forty-three Ontario farms in 1899, the average yield of grain of the Wellman Fife for the past season being 23.5 bushels per acre.

No.	Varieties.	Pounds per measured bushel.	Tons of straw per acre.	Bushels of grain per acre.
1	Red Fife	58.8	2.0	30.8
2	Herison Bearded	61.6	2.0	30.3
3	Saxonka	60.9	1.9	29.8
4	Wellman Fife	58.5	1.9	29.2
5	Red Fern	60.2	2.0	29.0
6	White Russian	57.8	1.9	28.9
7	Konisburg	60.7	1.8	28.5
8	Pringle's Champion	59.6	1.8	27.7
9	Blue Democrat	59.5	2.0	26.9
10	Lost Nation	57.9	1.8	26.6
11	White Fife	58.5	1.9	26.3
12	Colorado	59.0	2.0	15.8
13	Rio Grande	59.1	2.0	25.7
14	McCarlin	59.1	1.9	25.5
15	Manitoulin	58.5	1.7	25.2
16	Velvet Chaff Blue Stem	56.2	1.8	25.1

Among the varieties of spring wheat which we have grown for less than seven years, we have found the Speculation or Thick Set, the Salzer's Marvel, the Red North Dakota, and the Preston to be among the most promising.

Several varieties of spring wheat having a solid straw have been grown on our plot for a number of years, and some of them have shown themselves to be very heavy yielders; in fact five or six have given decidedly larger yields per acre than the very best of the common varieties. The following table gives the average yield per acre of each of six varieties of spring wheat belonging to this class for seven years in succession:

No.	Varieties.	Pounds per measured bushel.	Tons of straw per acre.	Bushels of grain per acre.
1	Wild Goose	61.9	2.0	39.5
2	Medeah	61.1	2.0	35.8
3	Bart Tremenia	62.5	1.8	34.9
4	Sorentino	60.3	2.1	32.9
5	Algiers	58.8	2.0	32.6
6	Ontario	57.7	2.0	22.9

It will be seen from the foregoing table that the *Wild Goose* has given decidedly the largest yield per acre of any spring wheat which we have grown. In former years millers paid much less per bushel for this variety than for the common varieties of spring wheat, which were much easier to grind. The Wild Goose is not only very hard to grind, but makes a yellow flour which gives a yellow appearance ance to the bread. During the last three years, however, there has been a considerable demand for the Wild Goose variety of spring wheat for export to Italy for the manufacture of macaroni; and this demand has become so keen that it has placed the price of Wild Goose wheat even higher than that of the finer varieties. So long as this demand keeps up, it is doubtful whether there is any other variety of spring wheat that will be so profitable for the farmers to grow as the Wild Goose variety.

SIX-ROWED BARLEY (*Hordeum Hexastichum*).

Six-rowed barley has been under cultivation in the southern part of Europe from the earliest times. Barley is one of the hardiest of the cereals, and can be raised through

a great range of climate. It is cultivated with success north of the Arctic Circle and at high altitudes in the Torrid Zone. The grain is used for culinary purposes, for feeding to farm stock, and for the manufacture of beer.

In the summer of 1899 fifteen varieties of six-rowed barley were grown in the Experimental department. Of these varieties the Mandscheuri, Scotch Improved, Common Six-rowed, Mensury, Imperial Six-rowed, California Brewing, and Six-rowed Baxter's Improved gave the largest yields per acre. The heaviest weights per measured bushel were produced by the Oderbrucker, Four-rowed Canadian, North-western, Scotch, Silver King and Manitoba Six-rowed, each of which produced upwards fifty-four pounds per measured bushel. The heaviest weight per measured bushel of all the six-rowed barleys was produced by the Manitoba Six-rowed, which gave an average of upwards of fifty-six pounds.

A large number of varieties of six-rowed barleys have been tested in the experimental grounds for several years in succession. The following nine varieties have given the largest average yield of grain per acre among all those tested for five years in succession. The Success variety, regarding which so much has been said recently, is also included in the list.

No.	Varieties.	Pounds per measured bushel.	Tons of straw per acre.	Bushels of grain per acre.
1	Mandscheuri	51.2	2.0	77.9
2	California Brewing	47.8	1.8	68.2
3	Oderbrucker	53.0	1.8	67.6
4	Scotch Improved	52.5	1.8	67.6
5	Imperial Six-rowed	52.2	1.7	67.2
6	Four-rowed Canadian	52.0	1.8	66.4
7	Mensury	52 1	1.7	65.2
8	Common Six-rowed	52.4	1.7	65.1
9	Six-rowed Baxter's Improved	52.5	1.8	61.3
12	Success	47.8	1.3	41.5

The *Mandscheuri*, which stands at the head of the list in average yield of grain per acre, was imported by the Agricultural College from Russia in 1889. It produces a good length of straw, which usually stands up well and is comparatively free from rust. Not only has it given good results in the experimmental grounds, but it has been grown with most satisfactory results in large fields on the College farm. It has been also distributed throughout Ontario in connection with the co-operative experimental work, and as a heavy yielder it has given decidedly the best results of all the varieties of barley which have been tested over the Province. The *California Brewing* variety, which comes second on the list, possesses a very stiff beard, which is very difficult to remove from the grain. The grain weighs light per measured bushel, and the straw is apt to lodge considerably before it ripens. The third variety on the list was imported from Germany, and to the *Oderbrucker* variety belongs the credit of producing the barley which has given the heaviest weight per measured bushel of all the kinds which have been grown in our experimental grounds for five years in succession. It will be observed, however, that the Oderbrucker yields about ten bushels per acre less than the Mandscheuri when they are grown under similar conditions. The Oderbrucker is also considerably weaker in the straw than the Mandscheuri. Much has been said of late years regarding the variety known as the *Success*, which has the advantage of being very early and of producing no beards. The weight of barley per measured bushel, however, is light, and the yield per acre is much less than that of some other varieties. There is no other barley in Ontario which has given so good all round satisfaction in the production of grain as the Mandscheuri, and we are pleased to notice that it is now grown quite extensively throughout the Province. It will be seen that there is a greater difference between the Mandscheuri and the Mensury than there is between the Mensury and the Common Six-rowed varieties of barley.

Two-Rowed Barley (*Hordeum Distichum*).

The two-rowed barley is easily distinguished from the other species by the head being more elongated and by their being two distinct rows of grain from one end of the head to the other. The heads of some varieties are long and slender, while those of other varieties are short, very broad at the base, and taper towards the extremity. The two-rowed barley is largely cultivated in England and in Central Europe, but it is not grown to any great extent in Ontario, although great efforts were made a few years ago by the Dominion Government to have it grown more extensively by Canadian farmers for exporting to England. With this object in view, the Canadian Government imported 10,000 bushels of the Carter's Prize Prolific Barley from England and sold the same to Canadian farmers at $2.00 per bushel in order to get it introduced.

Within the last fifteen years we have tested upwards of fifty varieties of two-rowed barley at the College. The following list gives the average results in weight of grain per measured bushel and in yield of straw and grain per acre of the twelve varieties which have produced the largest average number of bushels of grain per acre in five years' tests.

No.	Varieties.	Pounds per measured bushel.	Tons of straw per acre.	Bushels of grain per acre.
1	New Zealand Chevalier	52.7	2.3	63.8
2	Gold Foil Hansford's	53.5	2.3	63.2
3	French Chevalier	53.1	2.3	63.1
4	Empress	52.8	2.2	62.5
5	Two-rowed Canadian	52.4	2.0	60.5
6	Kinna Kulla	52.0	2.0	58.9
7	Jarman's Selected Beardless	54.7	1.7	58.3
8	Two-rowed Italian	52.6	2.1	58.1
9	Selected Canadian Thorpe	52.8	1.9	56.8
10	Vermont Champion	54.4	1.8	56.1
11	Highland Chief	53.5	2.0	55.9
12	Duckbill	52.9	1.9	55.4

It will be observed that the *Carter's Prize Prolific* variety is not included in the list. We imported some of that variety from England in 1889; and after growing it for five years, we discarded it from our experiments, for the reason that it came twenty-ninth in yield of grain per acre among thirty-seven varieties grown for five years in succession. The *New Zealand Chevalier* and the *French Chevalier* both occupy a high place in the average results of the varieties grown within the past five years. The seed of the *Kinna Kulla* barley was originally imported by the College from Sweden in 1889. The crop produces straw of medium length, which stands up remarkably well. The *Duckbill*, which has perhaps been grown in Ontario more extensively than any other two-rowed variety, stands twelfth in the list of yield of grain per acre among the two-rowed barleys grown since 1895.

In the results of the past year, the French Chevalier, New Zealand Chevalier, Two-rowed Italian, Kinna Kulla and Duckbill varieties were among the largest yielders. The Jarman's Selected Beardless, however, produced grain which weighed the heaviest in weight per measured bushel of all the kinds under experiment; the weight being fifty-eight pounds, which is perhaps the heaviest weight produced by any barley in any one year in our experimental grounds since 1889.

An important point in connection with nearly all varieties of two-rowed barleys is that they are from one to two weeks later in reaching maturity than the six-rowed barleys. This characteristic gives some of the two-rowed varieties special value for mixing with oats or peas to be grown either for green fodder or for the production of grain. It has been found that barley and oats sown together produce more grain per acre than when sown separately; and unless a very early variety of oats is used, it is necessary to have a two-rowed barley for mixing with the oats, in order that the two grains may mature about the same time.

Hulless or Naked Barley (*Hordeum decorticatum*)

The grain of hulless barley usually weighs about 60 pounds per measured bushel, while the standard weight of the common varieties in Ontario is 48 pounds per measured bushel. The skin of the hulless varieties is fine and transparent and is white, purple or black in color. The grain resembled wheat more than barley. The straw is apt to be weak, and when ripe becomes so brittle that the heads are easily broken off. Some of the varieties possess heads with six-rows and others with two-rows.

We had eleven varieties of hulless barley under experiment during the last season. Of these varieties, the *Guy Mayle* gave the largest yield per acre, namely, 50.4 bushels per acre, and the Large Skinned gave the lowest yield, or 37.1 bushels per acre. The weight per measured bushel of both the Black Hulless and the Purple varieties was 65.9 pounds. All the varieties under experiment during the year produced grain which weighed upwards of 60 pounds per measured bushel.

The following table gives the average weight per measured bushel and the yield of straw and of grain per acre of six of the highest yielding varieties of hullèss barley among those which have been grown in our experimental grounds for five years in succession.

Varieties.	Pounds per measured bushel.	Tons of straw per acre.	Bushels of grain per acre.
1. Guy Mayle	61.7	1.4	45.9
2. Purple	64.0	1.6	43.1
3. Black Hulless	63 7	1.5	42 3
4. Large Skinned	60 0	1.7	38.1
5. Hungarian	59.6	1.5	37.7
6. Winnipeg No. 2	60.3	1.7	37.4

The standard weight of 60 pounds per measured bushel has been used for the hulless barley throughout in reckoning the number of bushels per acre as given in the last column of figures in the preceding table.

The *Guy Mayle* variety which stands at the head of the list in yield per acre for five years produces a grain of purple color. The straw is of medium height and usually stands up fairly well. The *Black Hulless* variety, which comes third on the list, has perhaps been grown more extensively throughout the Province of Ontario than any other variety of hulless barley. It yields well and weighs heavily per measured bushel, but the straw is very weak, and is apt to be badly lodged before the crop is harvested. As some of the varieties of six rowed barley grow a stiffer straw and produce a much heavier yield of grain per acre than any of the hulless barleys, it is usually found more profitable to grow the six-rowed varieties in general farming in Ontario. However, some of the hulless varieties may be grown to good advantage under certain circumstances.

Winter Barley.

In the autumn of 1898, one plot of winter barley was sown in the experimental grounds. The crop grew splendidly in the autumn of the year and was very promising at the commencement of the winter, but in the spring of the year there was not a living plant to be found. We have sown one or more varieties of winter barley during each of the past eleven years and have found that in mild winters it comes through admirably and produces a heavy crop which gives a large yield of grain per acre. In severe winters, however, it is generally killed out completely. Although some seedsmen recommend the growing of winter barley quite extensively, the results of our experiments go to show that it is not advisable to grow it as a general crop in Ontario, unless some varieties can be secured which are more hardy than any which we have yet obtained ; and we have tested every variety which we have been able to secure from Germany, France, the United States, etc.

Rye (*Secale cereale*).

Rye is the characteristic food-grain of middle and northern Europe, and is used extensively by fully one-third of the population of Europe. It can be grown advantageously in those districts in which the soil is unsuited for other cereal crops. The grain is used for making bread, in the manufacture of malt liquors, and as a food for live stock. Rye is sometimes used when young as a pasture crop and when more fully grown for soiling purposes and for the production of hay. The straw of the mature crop, being long and straight, is used in the manufacture of hats, mats and fancy baskets; but it is of little use as a fodder.

Spring Rye.—Three varieties of spring rye were grown in our experimental plots in the past season. The yields of grain per acre of the different varieties were as follows: Dakota Mammoth rye, 50.9 bushel; Prolific Spring rye, 42.1 bushels, and Colorado Giant rye, 24.5 bushels. Two of these varieties have now been grown for five years, and have been given the following yield of grain per acre: Dakota Mammoth, 38.5 bushels, and Prolific Spring rye, 36.8 bushels. The Colorado Giant rye has been grown for only three years in succession, and has given an average of 22.6 bushels per acre, which is considerably less than either of the other varieties.

Fall Rye.—Several varieties of winter rye have grown in our plots for a number of years with good success. In the autumn of 1898, three varieties were sown in the same section of the field as the winter wheat. They all came through the winter well, and were very strong and vigorous in the spring, while the wheat standing near by was very badly winter-killed. The Mammoth winter rye and Monster winter rye appear to be the same variety, and have given about five bushel per acre more than the common winter rye of Ontario.

Buckwheat (*Fagopyrum esculentum*).

Buckwheat is a native of Northern Asia and has been grown as a cultivated crop for fully one thousand years It grows and produces a marketable crop on very poor soil, and it thrives admirably in cold climates. It is mainly grown for the production of grain, but it is also used for soiling purposes and for plowing under as a green manure.

We have grown six varieties of buckwheat in our experimental grounds, although two or three of the varieties are very similar in every respect. The three main varieties, namely, the Japanese, the Silver Hull, and the Common Grey, have each been grown in our trial plots for five years in succession. The crop in 1898, however, was failure, and that of 1899 was lighter than usual. In the average results of the three varieties grown for four years we find that the Japanese produced 20.4 bushels, the Silver Hull 16.2 bushels and the Common Grey 14.6 bushels per acre. In 1899 the Japanese gave 15.7 bushels, the Silver Hull 10.9 bushels, and the Common Grey 11.4 bushels per acre. *The Japanese* variety, which stands at the head of the list in yield per acre for 1899, and also in the average for four years, has given the largest yield of grain per acre in the co-operative experiments over Ontario for three years in succession. It is a very vigorous grower and produces grain of large size. The grain of the Silver Hull variety is smaller and plumper than that of the Japanese.

Indian Corn or Maize (*Zea mays*).

Indian corn is a native of America, and its cultivation in the United States is very extensive. The United States Department of Agriculture estimates the corn crop of the world for 1898 at 2,637,165,000 bushels. Of the total crop of 1898, the United States produced over two-thirds. The country which produced the next largest yield was Hungary, which was closely followed by Roumania and by Mexico. Ontario came ninth in the list, with about 24,000,000 bushels as the yield for that year. Indian corn is used for pasture, green fodder, dry fodder, and silage; and the mature grain is used in a great many forms for culinary purposes and as a food for live stock.

We have grown in all no less than two hundred and twenty-six varieties of corn in our experimental grounds within the past thirteen years. For general purposes, we have found (1) that the *Mammoth Cuban* and the *Mastodon Dent* are well adapted for the warmer soils of Southern Ontario; (2) that the *Wisconsin Earliest White Dent* for

Southern and Central Ontario, and (3) that the *Salzer's North Dakota*, *Compton's Early* and *King Philip* for Central and Northern Ontario.

More detailed information regarding varieties and experiments in methods of cultivating corn, etc., will likely be given in bulletin form on some future occasion.

Teosinte (*Euchlæna luxurians*).

Teosinte somewhat resembles Indian corn, and grows to a height of from eight to ten feet in the Southern States. The variety usually grown produces a great many stalks from each root, the number sometimes reaching as high as forty. The crop produced per acre is said to be very large, and the fodder is liked by all kinds of stock. The seed is sown in the spring, and in climates suited to its growth the plants will produce several cuttings during the season. It may be fed either green or dry. As the Teosinte has given such good results in the warmer sections of the United States, some of the seeds men of the North have been tempted to advertise it quite extensively. We have sown it in our experimental grounds for three years in succession. The germination has been rather slow and the crop has not reached a height of more than about three feet any year. From the knowledge gained from testing the crop during three years, we believe that it is entirely unsuited to the conditions which exist in Ontario, and we cannot at present recommend it to farmers as suitable to grow in Ontario for any purpose whatever.

Grasses.

Grasses are remarkably and evenly distributed in practically all portions of the inhabitable globe. In Ontario, no less than 2,505,422 acres were devoted to the hay and clover crop in 1899.

In all, forty eight varieties of grasses have been grown in comparative tests on the experimental plots at the College. These have included a large number of the cultivated grasses of England and America, and of several native varieties from Australia, Manitoba, etc. The following list gives the average yield in tons of hay per acre of each of twenty-one varieties of grasses grown for five years in succession :—1, Fringed Brome, 3.9 ; 2, Lime Grass, 3.3 ; 3, Western Rye, 3.3 ; 4, Bearded Wheat, 2.6 ; 5, Tall Oat, 2.5 ; 6, Timothy, 2.5 ; 7, American Lime, 2.4 ; 8, Orchard, 2.1 ; 9, Awnless Brome, 1.7 ; 10, Soft Brome, 1.6 ; 11, Meadow Foxtail, 1.4 ; 12, Canadian Blue, 1.4 ; 13, Meadow Foxtail, 1.3 ; 14, Red Top, 1.1 ; 15, Rhode Island Bent, 1.0 ; 16, Yellow Oat, 1.0 ; 17, Perennial Rye, 9/10 ; 18, Creeping Bent, 9/10 ; 19, Kentucky Blue, 4/5 ; 20, Fine Leaved Sheep's Fescue, 4/5 ; 21, Wild Timothy, 1/3. The varieties under the numbers 1, 2, 3, 4, 7, and 21 were imported from Manitoba, through the kindness of Mr. S. A. Bedford, Superintendent of the Dominion Experimental Farm in Manitoba. The hay of most of these varieties is somewhat coarse. It will be noticed that Timothy, which is so well known throughout Ontario, has made an average of exactly $2\frac{1}{2}$ tons per acre in the five years' experiments. This is nearly $1\frac{2}{5}$ tons per acre less than the crop produced by the Fringed Brome grass. The Awnless Brome grass (*Bromus inermis*) gave an average of 4.5 of a ton per acre less than that produced by the Timothy.

Besides growing the grasses separately, we have grown them in a great many combinations, especially with different varieties of clovers. Two mixtures of grasses and clovers have been under test for the last five years. The different varieties and the quantity of seed per acre used in each mixture were as follows : *Mixture No. 1.* Meadow Fescue 6 pounds, Meadow Foxtail 3 pounds, English Rye 2 pounds, Timothy 3 pounds, Canadian Blue grass 4 pounds, Orchard grass 3 pounds, Red Top 2 pounds, Yellow Oat 2 pounds, Lucerne 4 pounds, White clover 2 pounds, Alsike clover 2 pounds, Red clover 1 pound, and Trefoil 1 pound, making a total amount of 35 pounds of seed per acre ; and *Mixture No. 2.* Orchard grass 4 pounds, Meadow Fescue 4 pounds, Tall Oat grass 8 pounds, Timothy 2 pounds, Meadow Foxtail 2 pounds, Lucerne 5 pounds, Alsike clover 2 pounds, White clover 1 pound, and Trefoil 1 pound, making a total amount of 24 pounds of seed per acre. The average results for five years show that the yields of hay per acre from each of the two mixtures were as follows : Mixture No. 1, 2.6 tons ; Mixture No. 2, 3.6 tons. While these crops were not pastured, the results show that Mixture No. 2 produced decidedly the larger crop. All the varieties in Mixture No. 2 are exceedingly

hardy, and for general purposes it is one of the best and most permanent mixtures which we have found, and can be used for the production of pasture or of hay.

Other experiments with different combinations of grasses and clovers for the production of *hay* in short rotations are now in progress; also experiments in sowing grasses and clovers in the autumn of the year with and without a grain crop; likewise in the spring of the year with and without a grain crop.

Millet.

Millets are grown extensively in Siberia, India, Japan, and China, where the seed is used largely as a human food. It is estimated that the seed of millet in one form or another is used as a portion of the food of fully one third of the inhabitants of the globe. In Ontario, however, its chief use is for the production of pasture, green fodder, or hay. Some farmers grow millet more or less extensively as a regular crop, but as a rule it is sown to supplement some other crop which from one cause or other has proven a partial failure. For instance, in the year 1885, we had frosts during the first two weeks of May on six separate nights, the thermometer going twenty-two degrees below the freezing point on one occasion. This injured the young clover very much, and caused a great reduction in the amount of hay for that year. Hence the demand for millet seed became very great, some farmers paying as high as two and three dollars a bushel for the seed. In the farm department at the College, six acres of millet were sown that year and eighteen tons of good hay were grown, which did admirable service the following winter in supplementing the clover as a winter fodder. It is also found that in some seasons the amount of rainfall is so abundant during the latter part May and the early part of June that it is impossible to get the corn planted in good condition; in which case the land can frequently be used to good advantage in growing millet, as it does not require to be sown until comparatively late in the season. In this way the loss of the corn crop will not be felt so seriously as it would have been if no fodder crop had been secured from the land. It will, therefore, be readily seen that the millet crop is frequently an important one for the farmers of Ontario, as it can be used so readily when other fodder crops are apt to be deficient.

Thirty one varieties of millet have been grown under experiment at the College for the purpose of gaining information as to the most suitable kinds of cultivation in this Province. Fourteen varieties have now been grown for five years in succession. These varieties belong to four distinct classes, as will be seen by the classification here made The following list gives the average yield of hay per acre of each variety for five years:

	Tons of hay per acre.
1. Broom-Corn Millets. (*Panicum miliaceum.*)	
Japanese Panicle	5.5
White French	3.1
Red French	2.7
2. Foxtail Millets. (*Chœtochola italica.*)	
Holy Terror Gold Mine	5.3
Japanese Common	5.0
Golden Wonder	4.9
German or Golden	4.6
Magic	4.1
Salzer's Dakota	4.0
Hungarian	3.8
California	3.3
Common	3.1
3. Barnyard Millets. (*Panicum crus-galli.*)	
Japanese Barnyard	5.0
4. Pearl Millets. (*Pennisetum typhoideum.*)	
East India Pearl	4.9

For hay.—From the above table it will be seen that *Japanese Panicle* millet has given the largest yield of hay per acre, and that the Red French has given the smallest yield, the difference between the two varieties being 2.8 tons in favor of the Japanese Panicle. It will also be noticed that the varieties which have given the extremes in yield

per acre both belong to the Broom-Corn class of millets. The Japanese Crus-galli variety, which has given an average of five tons per acre for the five years, yields heavily some seasons, but in others it gives rather poor results. In 1898, the crop produced by the Japanese Crus galli both at our Experimental Station and throughout Ontario were very light.

Three varieties of millet have been used in the co-operative experiments over Ontario for two years in succession; and in averaging the results of successful tests made on ten farms, we found the varieties gave the following tons of green hay per acre, namely, Japanese Panicle, 6.4; Japanese Barnyard, 5 9; Hungarian Grass, 4.8.

For seed.—In 1899, twenty-two varieties grown in our experimental grounds were allowed to ripen and the crop was threshed. The following varieties produced the largest yields of seed per acre: Canadian, 35.8 bushels; Chinese, 34.4 bushels; California, 34.0 bushels, and Hog, 32.9 bushels. A number of varieties were also grown for seed in 1898 and in 1894. In 1898, the California gave a yield of 44.8 bushels per acre, which placed it second in yield of seed for that year; and in 1894 the California stood at the head of the list, with a yield of 41.9 bushels of seed per acre. Taking the average of the three years, the *California* variety has produced the largest amount of seed per acre.

SACHALINE (*Polygonum Sachalinense*).

Sachaline is a perennial plant, a native of northern Asia, where it grows in a moist climate and on wet land. A few years ago it was brought to this country and was most extravagantly recommended as a forage plant by a number of seedsmen in Canada and the United States. The following quotation is taken from a seedsman's catalogue for 1896: "The claims made for it are: perfectly hardy—even in Siberia; stands also the greatest heat; ground does not need to be plowed before planting; needs no cultivation, no manuring, no replanting; grows in poorest of soil or in wet lands where no other forage plant will exist. Once planted it stands for an age. Stems or leaves, green or dry, are greatly relished by sheep, cattle and horses. It is more nutritious than clover or lucerne; an excellent soil enricher. Grows 14 feet high by June and can be cut every month after till cold weather. The cultivation of Sachaline is very simple. Plant three feet apart each way at any season."

In the spring of 1895, twelve roots of Sachaline were purchased and also a quantity of seed. Both the roots and the seed were placed in good soil and plants were grown from each. The plants produced from the roots reached an average height of about two feet in 1895 and of three feet in 1896, and those from the seed an average height of from six to ten inches in 1895 and of seventeen inches in 1896. In 1897 and in 1898, the plants grew to a height of from three to five feet. The plants started to grow very early each spring and the new growth was nearly always frozen back, after which a fresh start was made. In the winter of 1898-9, all the plants but one were completely killed. The single plant which came through the winter alive did not start to grow until quite late in the season, and then the growth was very feeble. From our experience with the growth of Sachaline for four years we find it an unprofitable crop and entirely unsuited to our soil and climate.

PRICKLY COMFREY (*Symphytum Asperrimum.*)

Prickly Comfrey is a native of Caucasus and was very highly recommended and somewhat extensively introduced in this country a few years ago. It is a perennial and is propagated from the roots which are exceedingly hardy. The large coarse leaves grow luxuriantly, thus producing a large amount of forage.

In the spring of 1893, Prickly Comfrey roots were purchased and were planted in the experimental grounds, which were then located south-east of the main college building. The roots have been transplanted three times since that date and are still thriving fairly well, although the exceptionally severe winter of 1898-9 killed a few of them. Some of the others, however, were divided in the spring of the present year and we again have the full number of plants growing in the plot. We usually get three cuttings per season. The Prickly Comfrey is certainly a very hardy plant and an enormous producer of forage, but it is rather coarse and is not relished by the animals to which it is fed. It is said, however, that animals eat Prickly Comfrey fairly well after

they become accustomed to it. All things considered, it is doubtful whether Prickly Comfrey will ever be grown to any great extent in Ontario, where clover and other leguminous crops, which are valuable for fodder and as soil renovators can be grown so successfully. If, in some circumstances, it is very important to get a large amount of food annually from a small piece of land without fresh seeding each year, I know of no crop which is hardier or more abundant in its supply of fodder than Prickly Comfrey. The fodder from the plant may possibly be relished by cows, providing special care is taken in getting them accustomed to it by using it in small quantities at first and mixing it with meal, cut hay, etc., and then gradually increasing the quantity in the ration.

Giant Spurrey (*Spergula Maxima*).

The Giant Spurrey was grown quite extensively on the sandy soils in Michigan previous to 1893, at which time a bulletin was published by Prof. O. Clute, Director of the Station. In that bulletin the Spurrey was very highly recommended for light sandy soil. It is considered valuable, both as a soil renovator and for feeding to sheep and cattle.

As considerable was being said a few years ago regarding Spurrey, we wrote to the Michigan Agricultural College and secured a few pounds of seed and sowed it under different conditions in our experimental plots. The plants grew rapidly and produced seed in a very short time. The crop, however, was very light in all instances. Although it is some five years since the Spurrey was sown in our plots, we are not yet clear of the plants in those sections of the experimental grounds in which it was sown. Owing to the slow, slender growth of the plants and their rapid production of seed, it is almost impossible to pull all the plants before the seed is ripened and spread in the ground. We wish to caution our farmers against even testing the Spurrey on their farms, unless it is on the sandy soils in which almost nothing else will grow. Its rapid production of seed makes it a troublesome weed in cultivated land.

Yarrow or Milfoil (*Achillea millefolium*).

This plant is grown considerably in Europe and especially in England where it is considered to make a very valuable addition to sheep pastures. It is a perennial plant having white or pink flower clusters. In the spring of 1898, we sowed one plot in our experimental grounds with Yarrow seed. It germinated well and the crop made a good growth during the first year. Owing to the exceedingly severe winter of 1898-9, several of the varieties of grasses and clovers under experiment were badly winter-killed. The Yarrow, however, came through without any apparent injury from the cold weather. The plot was nicely covered with Yarrow plants which made a fairly even but not a very rapid growth. The crop was cut on the 11th of July, at which time the plants had reached an average height of 22 inches. The crop produced $3\frac{1}{2}$ tons of the freshly cut Yarrow and 9-10 of a ton of the cured hay per acre. It is scarcely expected that this crop can be grown satisfactorily for the production of either green crop or of hay, but these figures give data regarding the hardiness of the plant during a very severe winter and its growth the following season. Those farmers specially interested in sheep raising in Ontario may glean some information from this experiment regarding the growth of Yarrow in our climate, and from a knowledge of its use in England can better determine for themselves whether or not it would be advisable for them to use Yarrow in their sheep pastures as is done in Europe.

Potato (*Solanum tuberosum*).

The potato plant, which is a native of Chili and as far north as New Mexico, is now cultivated very widely and produces a large portion of the food of mankind. Besides being used as a food, the potato is largely employed for the manufacture of starch, spirits, etc. No less than 168,148 acres were devoted to the production of potatoes in this Province in 1899.

A great deal of attention has been devoted to testing potatoes at our Experiment Station within the past few years. Upwards of two hundred varieties have been grown and twenty-four distinct experiments have been carried on with different methods of preparing seed, with different systems of cultivation, with the application of commercial

fertilizers, etc. The results of many of these experiments have been given in my annual reports from year to year. The most important results of the experiments conducted for several years in succession will form interesting material for a bulletin before long.

Of all the potatoes which have been grown in our experimental grounds, we have found the *Empire State*, *American Wonder*, *Pearl of Savoy*, and *Rural New Yorker No. 2*, among the very best varieties for general cropping.

Field Roots.

That root culture lies at the basis of good husbandry is the candid opinion of thousands of the most successful farmers of long experience. The root crop occupies an important place in a rotation, furnishes an excellent means for cleaning the land, prepares a splendid seed bed for a cereal crop, and supplies a large amount of succulent and palatable winter fodder which is rich in valuable food constituents and is easily digested by the animals. Roots assist greatly in the economical feeding of grain and coarse fodder, such as hay, straw, fodder corn, and corn silage, with which they are used. Root crops in general are much relished by all kinds of farm stock, but of special service are Swedish turnips for young stock and fattening animals; mangels for dairy cows, breeding ewes, and hogs; carrots for horses, and sugar beets for cattle and hogs.

I wish to emphasize the importance of securing the very best varieties of roots for the particular soil and locality in which they are to be grown. The following varieties are among the very best for Ontario: *Swedish turnips*, Hartley's Bronze Top and Buckbee's Giant; *mangels*, Evans' Improved Mammoth Sawlog, and Carter's Champion Yellow Intermediate; *carrots*, Pearce's Improved Half Long White; and *sugar beets*, New Danish Improved.

Not only is it important to get the best varieties, but it is of still greater importance to sow large, plump seed, having good germinating power. In the average of two years' experiments with turnips, mangels, carrots and sugar beets, we have grown from large seed an average of three and one-half tons of roots per acre more than from medium-sized seed, and twenty-four tons per acre more than from small seed of the same varieties. It pays, therefore, to sift out all the small seed and sow nothing but the best. We sow mangels, carrots, and sugar beets about the first of May, and the Swedish turnips about the 20th of June. The seed is sown one inch deep in rows twenty-eight inches apart, with an ordinary root drill. When we sow on the flat surface, we get an average of one-half a ton of roots per acre more than when we sow on ridges. If we thin the plants when they are from one and one-half to two inches high, we get an increase of four tons of roots per acre as compared with thinning the plants when they are eight inches high. As the result of much experimental work, we now thin the plants to the following distances apart in the rows: *carrots*, four inches; *sugar beets*, seven to eight inches; and *mangels and turnips*, ten to twelve inches. The reasons for thinning thus cannot be given in this brief report. Soon after the seed is sown, the soil between the rows is stirred with a weeder, from which a few of the teeth have been removed. The cultivation is then done at intervals of about two weeks by means of a one-horse scuffler which loosens the surface soil, destroys the young weeds and preserves the soil moisture.

Chicory (*Cichorium Intybus.*)

The plants of chicory are used as a fodder crop and also for culinary purposes. As a fodder plant, it is spoken of as being specially adapted to very poor soil; and its long tap roots help to carry it through dry seasons when grown even on very dry land. It is principally grown as a fodder crop in Europe, but alfalfa is now supplanting it largely as food for live stock. The large-rooted variety of chicory has been grown in our experimental grounds during the past four years, although in 1898 the crop was practically a failure. The average annual yield of fresh roots per acre for 1896, 1897, and 1899 is 7 tons. In some parts of Ontario, Chicory is grown quite largely and the roots are hauled to a mill where they are dried and prepared as a market product. If they wish, farmers can grow, dry, and roast chicory for themselves and use it either as a salad or in combination with coffee. Chicory is grown in much the same way as a crop of parsnips or carrots.

Rape (*Brassica Napus.*)

The rape plant resembles the Swedish turnip in its leaf, and the cabbage in its root. It is, therefore, the leaf and the stem which form the valuable portion for feeding purposes.

Varieties.—There are several varieties of rape, such as the Dwarf Essex, Victoria, White Flowering, Umbrella, and German Summer. Of these varieties the Dwarf Essex and the Victoria are the most extensively advertised. We have had these two varieties grown under similar conditions during the past five years. The average result for the five years show that the *Dwarf Essex* variety has produced 23.2 tons and the Victoria 20.3 tons per acre. There is no other variety of rape which has given nearly so good satisfaction as the Dwarf Essex. The German Summer (bird-seed rape) should never be grown for agricultural purposes, as it seeds the same season as sown, and is, therefore, a variety poor in feeding properties and difficult to eradicate. This point should be carefully observed, as serious trouble has sometimes resulted from sowing large areas of this variety.

Soils and Manures.—The most suitable soils for rape are fairly moist loams, rich in vegetable matter. Soils deficient in vegetable matter should receive a coating of stable manure. A dressing of eighty pounds of nitrate of soda per acre when the plants are two inches high will usually increase the crop fully two tons per acre. Land should be prepared for rape somewhat similar to that for corn or turnips.

Seeding and Cultivation.—About the middle of June, large, plump seed should be sown at the rate of one pound per acre in rows thirty inches apart and to a depth of about one inch. A thorough stirring of the first two inches of the ground between the rows every ten days or so increases the growth of the rape wonderfully. Flat cultivation is generally preferable.

Feeding Rape.—Rape makes an excellent late summer and autumn pasture crop for fattening cattle, sheep and lambs, for which purpose we have used it extensively. One season we pastured over 600 lambs on rape and sold them for the Buffalo, Halifax and English markets. When rape is pastured by hogs, it is considerably wasted, and when fed to cows it is apt to give the milk an undesirable flavor.

Animals should never be turned on rape when hungry. There is not much danger of animals bloating if they are turned on gradually at first, allowed free access to an old pasture field, and furnished with plenty of salt. There is practically nothing gained by feeding grain to animals when on rape. Lambs gain in weight from eight to twelve pounds per month on rape alone. We have cut green rape and fed it to hogs in the months of August, September, October and November with marked success. We have have also fed it to cattle and sheep in the stable until after Christmas with good satisfaction.

Other Uses of Rape.—Rape grows best in cool weather. When sown on land where a cereal crop has been harvested, it frequently makes a good growth of plants which can be plowed under as a green manure or used for late fall pasture. Owing to its broad and spreading leaves, rape has a wonderful power of smothering weeds, and is, therefore, an excellent crop for cleaning the land.

Kale or Borecole.

Kale is a cultivated variety of Brassica oleracea, differing from ordinary cabbage in the open head of the leaves which are used for culinary purposes as greens, and also as food for cattle. The Jersey Kale or tall Jersey cabbage is used very extensively in the Island of Jersey as a fodder crop. Seed of some of the varieties of Kale has been imported by our Experiment Station from Jersey Island, England, Quebec and the United States, and the seed of other varieties have been obtained in Ontario. The yield of green crop per acre produced by the different varieties in 1899 is as follows: Marrow Stem Kale, 11.5 tons; Thousand Headed Kale, 11.4 tons; Georgia Collards, 10.6 tons; Tall Green Curled Scotch Kale, 9.9 tons; Jersey Kale, 9.8 tons; Hardy Curled Kale, 9.3 tons: Purple Sprouting Borecole, 9.1 tons; and Large Tall French Brussels Sprouts, 6.7 tons. Five of these varieties have now been grown in our plots under similar conditions for three years in succession, and the *Marrow Stem Kale* has produced the largest average yield of green crop per acre of the five varieties grown for the three years, the yield being

24.9 tons per acre. In 1897, each of the varieties of Kale was fed to dairy cows, and the milk and butter produced by the animals was carefully examined and found to possess more or less taint in every instance.

CABBAGE *(Brassica oleracea).*

Although the cabbage has been used to a considerable extent in Great Britain as a food for sheep and hogs, but little has been done with this crop for field culture in Ontario. The seed of a few of the varieties which are more commonly used as a fodder crop in England was imported in the spring of the present year, and sown in our experimental grounds in the month of June. The seed was bought from the well known firm of Sutton & Sons, Reading, England. The experiment was conducted in duplicate, the seed being sown similarly to that of rape. The crop of the one experiment was harvested on September 9th and the other on October 3rd, and the plants of each variety were weighed immediately on being cut. In average yield of total crop per acre, *Sutton's Earliest Drumhead* gave 14.7 tons, Sutton's Earliest Sheep Fold 13 tons, Sutton's Best of All Savoy 11.7 tons, and Sutton's Late Drumhead 11.5 tons. These yields compare very favorably with the yield of the Dwarf Essex rape grown under similar conditions, the average yield per acre of which was 12.1 tons. The experiment with the different varieties of cabbage will likely be continued for a time, in order to secure fuller information regarding the comparative values of cabbage and rape as a food for live stock, especially lambs.

WHITE MUSTARD (*Brassica* or *sinapis alba*).

White Mustard is grown in Great Britain as feed for sheep and as a catch crop for plowing under for green manure. A smaller quantity is sometimes sown with rape in order that the two can grow together as a sheep pasture. It is claimed that a small quantity of white mustard sown with the rape prevents lambs from bloating when pasturing the crop. It is considered by some feeders to be better than rape for late sowing in the fall, as its growth is more rapid than that of rape and will give a good pasture crop for lambs in a shorter length of time. The white mustard has been tested in our experimental grounds for several years, and the growth has been satisfactory. When sown in July or August, it usually gives a larger yield than when sown in May or June, at which time it is inclined to produce seed to rapidly to make a good pasture crop. Mustard is, therefore, sometimes sown on land on which turnips or rape has failed and a fair-sized crop is generally secured.

One year we allowed the white mustard to ripen its seed, which was harvested and threshed, the yield being at the rate of 750 pounds of white mustard seed per acre. The well known codiment called "Mustard" is made from white mustard seed in much the same way that flour is made from wheat. The strongest flavored mustard, however, is produced from grinding the whole seed, as the bran contains the greater amount of pungent oil to which the flavor is chiefly due.

FIELD PEA (*Pisum arvense*).

The common field pea is a leguminous plant and a native of Italy. It has been in cultivation many hundred years and is chiefly grown for its grain. It is also used in mixing with oats for the production of green fodder or of hay. For soiling purposes, it produces a large yield of very nutritious food. The seed is exceptionally rich and is of great value for using with other grain in fattening cattle and hogs. The straw is used extensively as a food for sheep, and is sometimes mixed with other coarse fodder for feeding to dairy cows. Field peas can can be very satisfactorily used in Ontario as the cow peas are used in the Southern States for plowing under as a green manure.

Exactly one hundred varieties of peas have been grown in our experimental grounds within the past eleven years. The greater part of these have been tested for at least five years in succession. The average results for five years show that twenty varieties have produced a yield of upwards of thirty bushels per acre. The following list gives the average weight per measured bushel, and the average yield of both straw and grain per acre of the twenty largest yielding varieties. It also gives the results of few varieties which

come lower in yield, but which are quite well known throughout the Province, owing to the length of time they have been grown or to the recommendations which they have received elsewhere.

No.	Varieties.	Pounds per measured bushel.	Tons of straw per acre.	Bushels of grain per acre.
1	White Wonder	63.6	1.2	39.0
2	New Zealand Field.	61.2	1.3	37.8
3	Glory	61.7	1.2	36.2
4	Early Britain	60.1	1.3	36.1
5	Egyptian Mummy	64.4	1.6	35.8
6	New Zealand Brown	59·4	1.4	35.3
7	Tall White Marrowfat	61.8	1.5	34.2
8	New Zealand Blue	62 5	1.2	33.9
9	Potter	61.8	1.4	33.1
10	Improved Grey	59 2	1.2	32.2
11	Chancellor	62.3	1.3	32 0
12	D'Auvergne	62.1	1.2	31.7
13	Common Grey	59.0	1.5	31.4
14	William the First	58.1	1.1	31.2
15	Princess Royal	60.4	1.2	31.2
16	White-Eyed Marrowfat	62.4	1.5	31.1
17	Early Racehorse	60.1	1.2	31.0
18	Nine Pod	59.5	1.4	30.7
19	Prussian Blue	61.7	1.8	30.4
20	Nimble Taylor	58.6	1.3	30.2
21	Crown	60.1	1.3	29.7
23	New Canadian Beauty	62.2	1.3	29.1
26	Black-Eyed Marrowfat	61.5	1 3	28.9
27	Sword	62.0	1.4	28.9
28	Golden Vine	62.7	1.3	28.5
35	Multipliers	61.9	1.6	27.2
36	Striped Wisconsin Blue	62.7	1.7	26.5
40	Pride of the North	60.4	.9	19.1

The *White Wonder*, which stands at the head of the list in average yield of grain per acre among all the varieties of peas grown for five years in succession, has a medium-sized white grain of good quality. This variety, however, requires good strong land, as the straw is shorter than that of most other varieties. The grain of the New Zealand Field pea is white and of about the same size as that of the Multipliers. The seed of both the White Wonder and the New Zealand Field pea was imported from New Zealand, and the supply of grain in Ontario is still quite limited. The Glory variety, which was imported from England, has a large white grain and a medium length of straw. *The Early Britain* is a brown pea imported from England, and one which has given excellent results both on our experimental grounds at Guelph and in the co-operative experiments throughout Ontario. It has been distributed with three other varieties in each of the past three years to Ontario farmers and has given the largest average yield of grain per acre of the varieties sent out in each of the three years. The Egyptian Mummy, which has been grown in Ontario for the past fifteen or twenty years, produces a large white pea, which weighs very heavy per measured bushel. The straw is usually quite coarse in growth. The Chancellor variety of peas, which comes eleventh on the list in yield of grain per acre, produces a small white pea and matures early. *The Prussian Blue* pea, which is extensively grown over Ontario, comes nineteenth on the list in yield of grain per acre. This pea, however, is well adapted to poor and average soil as it produces a large amount of straw; in fact, there are but few varieties which yield so large an amount of straw per acre as the Prussian Blue variety. The Golden Vine is the name of the little white pea known as the Common White pea of Ontario and as the Canada Field pea in the United States. The Golden Vine has given an average of about ten bushels per acre less than the White Wonder in the results from growing the two varieties under similar conditions for five years in succession.

In the spring of 1899, the Ontario Department of Agriculture received a communication from England to the effect that there was a big demand in England for what is known as *the Wisconsin Blue pea*, and that the price for that variety was

higher than for the small Canadian Blue pea. Samples of peas were also received by the Ontario Department of Agriculture from England, and the communications and samples of peas were forwarded to my office. I find the Wisconsin Blue pea to be identical with the Striped Wisconsin Blue, and the Small Canadian Blue identical with the Prussian Blue peas mentioned in the foregoing table. The following letter gives interesting information regarding the demand for each of the varieties of Blue peas for the English market:

CANADA GOVERNMENT AGENCY,

15 Water Street, Liverpool, England,

SIR,—By this mail I am sending you a sample of Wisconsin Blue peas which has been handed to me by a Liverpool firm (Kamm & Co.,) who state that these peas are grown largely in the district of Wisconsin, U.S.A., and that they have come into favor here as a cheap boiling pea, which is rapidly taking the place of the small Canadian Blue. They are shipped here in strong bags, holding about one and a half hundredweight, and the value to day is 36*s.* per 504 lbs. When steeped they swell well and boil soft and are in request for export and ships' stores. Last season there was a large trade, when the ruling price was 30*s.* for 504 lbs., but the higher price this year has checked the demand and small English Blue can compete successfully.

I beg to suggest that experiments be made with the samples that are being sent, so that the attention of Canadian agriculturists may be directed to the advantages they may be found to possess. There is no doubt that English buyers would prefer to purchase Canadian produce rather than that from the United States if a similar article can be exported from the Dominion. Believe me,

Yours very truly,

S. H. MITCHELL.

In order to glean more definite information regarding the productiveness of these two varieties of peas throughout Ontario, we distributed both kinds to a large number of farmers in the spring of 1899. Ninety of these experimenters conducted a successful test on their own farms and forwarded good reports. From these reports we learn that an average of 27.15 bushels per acre were produced by the Prussian Blue and an average of 25.15 bushels per acre by the Striped Wisconsin Blue. It might be well for the farmers in the Northern part of Ontario, around Owen Sound for instance, where there is no trouble from the pea weevil (*Bruchus pisi*) to consider the advisability of growing the Wisconsin Blue peas for the English market. The information here given regarding the comparative price of the two varieties in England, and the comparative yield of the two varieties at the Agricultural College for five years and on ninety farms throughout Ontario in 1899, should be of much service in coming to a conclusion as to the advisable course to pursue in trying to meet the demand for the English market.

The pea weevil (*Bruchus pisi*) is causing great damage in the pea crop in the southern part of Ontario, and we have found only two varieties which are entirely proof against its ravages. The two varieties are *the Egyptian* and *the Grass,* which are quite different from other varieties of peas in their character of growth. These two varieties of peas are described in this report under separate headings. Of the ordinary varieties of field peas we have found that *the Oddfellow* has been freest from the ravages of the weevil, and that *the Mummy* has taken the second place in this particular.

COWPEAS.

Cowpeas are extensively used in the Southern States as a green manure. It is somewhat difficult to make hay out of cowpeas, but with care an excellent quality of hay can be produced. Owing to the high feeding quality of cowpea hay it is frequently considered advisable to feed the crop and return the manure to the land.

There are over one hundred named varieties of cowpeas grown in the United States. Nearly all of these, however, require such a long season of growth that they are suited only to the warm climate of the South. A few of the earlier kinds have been grown in the Northern States, and have been tested at our Experiment Station at Guelph. One or

more varieties have been sown in our experimental grounds during each of the past eight or nine years. It has been found, however, that nearly all varieties are too late for the climate of Ontario, unless it is in some instances for producing a green crop for plowing under. They seldom grow to a height of more than ten to twelve inches, although an average height of twenty-five inches was made by the Black-Eye variety of cowpeas in 1899. The varieties which we have mostly grown are the Warren's Extra Early, Black-Eye, New Era and Whip-o-will. Of these varieties the New Era and the Whip-o-will proved to be the earliest. None of these varieties, however, have produced an average of more than about one and a half tons of green crop per acre during each of the past two years. During the entire period in which we have had the cowpeas under experiment no grain has been produced until the present year, when the plants became sufficiently well matured to produce a crop of peas, which was, however, very light. The yield of the New Era was the largest, but it was only a little over two bushels per acre. The Experiment Station will still be on the watch for some varieties of cowpeas which will be sufficiently rapid in growth to prove of value for cultivation in Ontario. We are at present unable to recommend any of the varieties which we have grown as being suitable for our northern climate.

Grass Peas.

The Grass pea is an annual legume which has been grown to a limited extent in Ontario for several years. The stems of the plants are flat and the whole crop is greatly relished by animals when used as a green fodder. It produces a moderate amount of grain, which is angular in form and very hard. One marked advantage of the grain of the flat pea is that it is entirely proof against the ravages of the pea bug (*Bruchus pisi*). We have grown the Grass pea for several years at the College, both as a grain and as a fodder crop. In the average results of four years' experiments, the Grass pea has produced 8.9 tons of green fodder per acre. This is more than double the yield produced by horse beans when both crops have been grown under exactly similar conditions. It is also a little over two tons per acre more in yield than the green crop produced by the Prussian Blue variety of peas when both were grown side by side for four years. As a producer of grain it has given a yield of 17 1-2 bushels per acre in the average tests for four years. The Grass pea has been sent out over Ontario in connection with the co-operative experiments for three years in succession and has been very popular among the experimenters as a producer of green fodder. We believe that in those districts of Ontario where the pea bug (*Bruchus pisi*) is doing so much havoc with the common varieties of peas, the Grass pea can be used to good advantage, and the crop can be utilized either as a green fodder or for hay, or can be allowed to mature and the grain and the straw both can be used for feeding to the live stock in the winter.

Egyptian Pea, Coffee Pea, Chick Pea, Etc. (*Cicerarietinum*).

The Egyptian pea is a leguminous plant grown extensively in the Mediterranean regions and in Central Asia. It has been used as feed for cattle and also as an article of human food for upwards of three thousand years. The seed is somewhat larger than the common pea and is enclosed in a short thick hairy pod, there being from one to two peas in each pod. The plant itself is seldom used except as a soil renovator, but the yield of grain is large and is ground into meal which makes a very valuable cattle food when fed in much the same way as cotton seed meal. As a human food, the peas are used in various ways. The ripened grain is sometimes prepared for the table in much the same way that we prepare our Canadian beans for culinary purposes. Egyptian peas are sometimes roasted and used as a substitute for coffee.

We have had the Egyptian pea under experiment since the spring of 1893. The crops of 1897 and 1898, however, were injured, and the results for these years are of no value. The average yield of grain per acre for 1893, 1894, 1895, 1896, and 1899 is 40.3 bushels, and the weight per measured bushel for the same period is 61.6 pounds. This variety of peas was sent out over Ontario in connection with the co-operative experiments along with three other varieties of peas in each of the years 1896 and 1897. In 1896, it was successfully tested on seventy-three Ontario farms, and gave an average of

27.4 bushels per acre, and in 1897 it was successfully tested on fifty-six Ontario farms and gave an average of 19.8 bushels per acre. It was found a little difficult to compare it properly with the other varieties of peas owing to the Egyptian variety requiring a somewhat longer period to mature. It usually takes about four months from seeding time until the crop is ready to harvest. The Egyptian pea requires good strong soil, giving poor results when sown on light and dry sandy soil, but producing a large crop which stands up well on rich low-lying ground. This variety seems to be well adapted to soils which usually cause the ordinary varieties of peas to produce too much straw that is apt to mildew. One very important point in favor of the Egyptian pea is that it is never troubled with the pea weevil, usually called pea bug (*Bruchus pisi*), which is causing very serious trouble to the pea crop of the southern part of Ontario.

Flat Pea (*Lathyrus sylvestris*).

The Flat pea is a perennial, legume, and is a native of Eastern Europe and Northern Asia. The plant grows very slowly at first and requires three years to reach its full size, after which it holds the ground for many years when grown under favorable conditions. It seems best adapted to arid regions where the system of irrigation is followed. Some of the Northern seedsmen have made extravagant claims for the Flat pea.

The seed of the Flat pea has been sown on the experimental plots at various times within the past nine years. The growth on some occasions has been quite satisfactory, and on others the crop has been poor. From our study of this plant, it seems unsuited for Ontario. The seed is very expensive; three years is required to bring it to full size, during which time there is much labor in keeping the land free of weeds; and the fodder produced is evidently less relished by animals than would be supposed from the claims made by those who are specially interested in its introduction. The following quotation is taken from the catalogue of a seedsman located in one of the Northern States: "All cattle, hogs, horses, indeed everything, relish *Lathyrus sylvestris*." They have grown *Lathyrus sylvestris* at the Experiment Station at Lansing, Michigan, for several years past, but have found in the feeding tests made there that live stock showed a decided distaste for the forage. Both sheep and cattle lost in weight when either the green or ensiled forage was fed as part of the ration.

Field Beans.

The common bean has been in cultivation from remote antiquity in Europe as well as in Asia. According to the report of the Bureau of Industries for Ontario, we learn that 40,485 acres of land were devoted to the cultivation of beans in the present year.

We have grown forty one varieties of beans in our experimental grounds within the past thirteen years. Of this number thirty varieties have been grown in two different places in our experimental grounds in each of the past three years. The following list gives the average of each of fifteen of the heaviest yielding varieties for the three years:

	Varieties.	Pounds per measured bushel.	Bushels of grain per acre.
1	White Wonder	65.8	23.3
2	Burlingame Medium	65.4	22.0
3	Schofield Pea	62.2	21.9
4	Pearce's Improved Tree	66.2	21.0
5	Medium or Navy	65.7	20.7
6	Snowflake	67.3	18.8
7	Wisconsin Tree	65.9	18.8
8	Burpee's Electric Tree	66.0	18.7
9	Day's Improved Leafless	65.6	18.6
10	Great Western	66.2	17.6
11	Boston Pea	66.0	17.2
12	Marrowfat	64.6	15.8
13	Dwarf Horticultural	60.1	15.3
14	Extra Early Field	62.8	14.5
15	Zealand Haricots	62.5	14.1

The White Wonder variety, which stands at the head of the list in average yield of grain per acre, is early in reaching maturity and produces a small white bean of good quality. The White Wonder is a good representative of the small white beans; the Navy, of the medium white beans, and the Marrowfat, of the large white beans. It will be seen, however, from the results in the foregoing list that the White Wonder gave an average of about $2\frac{2}{3}$ bushels per acre more than the Medium or Navy variety, and about $7\frac{1}{2}$ bushels per acre more than the Marrowfat variety. The Small White Field bean, which is not mentioned in the above list, comes seventeenth in the yield per acre. Three varieties of beans, under the names of Zealand Haricots, Giant Haricots, and Large White Haricots, which were reported by an English firm in the spring of 1897 as likely to give excellent results in Canada, have so far made low records. A quantity of each of these varieties was imported from England in the spring of 1897, and the seed of two varieties was sown in each of the past three years. The Giant Haricots, however, did so very poorly in the experiments of 1898 that they were dropped from the tests of the present year. In the average results of the three years' experiments, the Large White Haricots now occupy the last place in yield of grain per acre, the average being only 8.2 bushels, or not much over one-third of the yield produced by the White Wonder variety. The Zealand Haricots, however, stands fifteenth in point of yield of grain, as will be observed in the results given in the foregoing list.

Soy, or Japanese Beans.

The Soy beans, which are also called Soja beans, have been grown for a great length of time in Japan and in South-eastern Asia. The Soy bean is a leguminous plant, being similar to clover, peas, and our common beans in this respect. The plants are upright in growth, branch considerably, and usually contain a very large number of pods. The varieties of Soy beans are numerous, but many are late in maturing and are best suited to the warmer climates. There are some of the varieties, however, which are much earlier in maturing and are better adapted to the colder climates. About eighteen years ago Prof. Georgeson, then connected with the Agricultural College in the State of Kansas, imported from Japan fifteen varieties of the Soy beans, with which he conducted practical experiments on the Experiment Station grounds and found that five of the varieties gave good results. These five varieties were imported from Kansas some seven years ago for growing in our experimental plots. The Yellow Soy bean has given decidedly the best results among the five varieties which were obtained from Kansas. A few years ago the Agricultural College of Massachusetts also imported a number of varieties of the Soy beans from Japan, and three of these have now been tested in our experimental grounds here at the College.

The *Yellow Soy* bean which was imported from Kansas has given an average of eight tons of green crop per acre, being two and one-quarter tons per acre more than that produced from the common beans, and three and one-quarter tons per acre more than that produced from the horse beans. In each of the past three years the *Medium Green* Soy bean has given the largest yield of green crop per acre among the three varieties imported from Massachusetts, but in each of these years the Yellow Soy variety has given better satisfaction than the Medium Green in yield of crop per acre, although the results in 1898 were practically equal. We hope to grow these two varieties in larger lots, in order that we can compare them thoroughly in regard to their qualities for green fodder and for hay.

In the production of grain the Yellow Soy variety has produced the greatest yield in each of the tests made at the College. Of the different varieties tested during the past three years, the Extra Early Dwarf is the earliest, the Yellow Soy the second earliest, the American Coffee Berry the third earliest, and the Medium Green is the latest to reach maturity. In many of the localities in Ontario the Medium Green variety of Soy beans would be too slow in maturing to produce seed.

In the spring of 1899 three varieties were sent out over Ontario in connection with the co-operative work, to find out how these varieties would succeed over the Province. The varieties distributed were the Medium Green Soy beans, American Coffee Berry and the Extra Early Dwarf Soy beans. The Medium Green and the American Coffee Berry gave upwards of twenty bushels of seed per acre, and the Extra Early Dwarf an average

of about thirteen bushels per acre. The Yellow Soy bean was not included in the experiment, as the seed of that variety was not available at the time. Arrangements have been made, however, to secure seed of this variety from the Kansas Experiment Station, for 1900. We feel justified in making somewhat extensive experiments with the Soy beans on account of the strong claims made for these beans in a few places where they have been grown. The following is taken from the bulletin issued by the United States Department of Agriculture on the Soy bean as a forage crop :

"The Soy bean thrives best in soil of medium texture well supplied with lime, potash and phosphoric acid. It endures drouth well, is not easily injured by excess of moisture, and may be grown about as far north as corn.

"The early varieties are best for seed crops, and the medium or late varieties for hay, forage and silage. Seed may be planted at any time during the spring and early summer, but preferably as soon as the ground becomes well warmed up. Drill one-half to three-fourths of a bushel to the acre; broadcast, three-fourths to one bushel.

"Little cultivation is needed when growing for forage; when for seed, keep weeds down until plants shade the soil. The Soy bean may be used for soiling, pasturing, hay, and ensilage, or the beans may be harvested and fed as grain.

"The forage is very rich in fat and muscle-making materials, and should be fed with fodder corn, sorghum, or some other feeding stuffs rich in fat-forming nutrients. The seed can be fed to the best advantage when ground into meal, and is almost equal as a concentrated food.

"Cut for hay when the plants are in late bloom or early fruit; for ensilage the crop can be cut later, but it is better to cut before the pods begin to ripen; for green forage cutting may begin earlier and continue rather later than for either hay or ensilage; the crop may be cut for seed after the pods become about half ripe.

"The Soy bean is excellent for green manuring and for short rotations with cereal crops. It should be well limed when plowed under as a green manure."

The Experiment Station at Kansas is growing the Soy beans very extensively; they had no less than sixty acres in Soy beans this year. From a bulletin issued from that Station on September 25th, 1899, we quote the following: "The sixty acres of beans average fifteen and one-half bushels per acre, making the cost of production fifty-five cents per bushel, or about eight dollars and forty cents per acre. Soy beans as a feed take the place of oil or gluten meal, and in composition are richer than oil meal. In feeding them to milch cows, fattening cows and hogs, they have given astonishing results. When the beans are let thoroughly ripen in the field, the straw is worthless, but if cut and cured while green makes excellent hay. They make excellent hog pasture and are a good crop for soiling."

We understand that at least five complex food products are prepared from the Soy beans in Japan, although the beans are seldom used alone as a vegetable. They are also frequently dried and roasted, and used as a substitute for coffee.

Horse Beans (*Fava vulgaris.*)

The horse bean is a coarse, rank-growing annual legume which is used quite extensively in Europe as a forage plant. There are several named varieties of horse beans, a number of which have been grown at the College. During each of the past nine years, from one to six varieties have been under test, but in most of the years the crop has proved unsuccessful. During the hot, dry weather of the summer the leaves drop from the plants and the stems become dry and turn black. In some instances there was a second growth from the roots after the fall rains saturated the ground. Among the different varieties tested, the *small horse bean* has given the best results, the average yield of green crop per acre produced from this variety in the average of five years' experiments being 4.8 tons per acre. Even this variety, however, has not given general satisfaction as a fodder crop. We have found it to answer very nicely, however, for sowing late in the season with other leguminous crops, such as peas and Crimson clover, for plowing under as a green manure. The erect growth of the plants helps to hold the common peas up from the ground and thus assists in producing a satisfactory crop for plowing under. The horse bean seems to grow better in cool, moist weather than in the hot, dry seasons which occur so frequently in Ontario.

VELVET BEAN (*Mucuna utilis.*)

The Velvet Bean, or Banana Field Pea, is a leguminous plant, and is becoming recognized more and more as a valuable crop for forage and for soil renovation in the American Southern States. In some places it is becoming a close rival of the Cow Pea. The vines grow long, and the forage closely resembles that of other beans.

It is quite doubtful whether the Velvet Bean will thrive so far north as Ontario. It has been sown in our experimental grounds for only one season, and in that test the results were quite unsatisfactory, but mainly owing to the poor germination of the seed. The crop will likely be tested again in our experimental grounds.

CLOVER.

Clover belongs to the order leguminosæ, or bean family. There are several varieties of clover grown more or less extensively throughout this Province, the most prominent of which are the Red Clover (Trifolium pratense), Mammoth Clover (Trifolium medium), Alsike Clover (Trifolium hybridum), and Crimson Clover (Trifolium incarnatum). Of these the Red Clover is decidedly the most popular and is grown the most extensively.

Each of the varieties ef clover mentioned above, and also several other kinds, have been grown in our experimental plots more or less in past years. We have just completed an experiment in which we had the Common Red and the Alsike grown side by side in three different places in our experimental grounds. The following gives the average results of each variety for the first and the second cutting the same season :

Varieties.	Tons per acre of first cutting.	Tons per acre of second cutting.
Common Red Clover	2.9	.80
Alsike Clover..........................	2.9	.08

These figures show that the yields of the first cutting of the two clovers were equal. It also shows that the second cutting of the Common Red was ten times as great as that of the Alsike variety.

The average annual total yield of Green Clover per acre for five years, including three separate seedings of each of three prominent varieties of clover, is given in the following summary results :

	Tons of green hay per acre.
Mammoth Red, seeded 1891, 1894 and 1897............	7.2
Alsike, " " "	7 0
Common Red, " " "	6.2

The Mammoth Red variety is somewhat coarser and is several days later than the Common Red variety. The first crop of the Mammoth Red is generally large, but the after growth is usually very small.

Crimson Clover has been tested in each of the past six or seven years, and when sown in the spring produces an average of about one and one-fifth tons of hay per acre the same season ; but if sown in the autumn, as is the custom in some of the Eastern States, we find that on the average about four-fifths of the plants are killed during our severe winters. Although Crimson Clover has been very extensively advertised, we find that, unless in exceptional cases, it is very unreliable in our climate, and we cannot advise its general cultivation in Ontario.

ALFALFA OR LUCERNE (*Medicago Sativa*).

Lucerne is a native of Western Asia, and has been under cultivation for upwards of twenty centuries. It is considered the best crop for hay and for green fodder which can be grown in the Western States. It is a perennial legume which does not reach its full size until the third year. From two to four cuttings can usually be secured annually from a well-established Lucerne field.

That Lucerne is a crop of great importance for California, Colorado and other Western States is a well-established fact. As a plant suitable for general cultivation in the

extreme Northern States and in Ontario, however, it is not so certain. It has been tested here and there over the Province of Ontario for many years, but as yet it has not been grown to any large extent, except in two or three localities which seem to be specially adapted to its growth. In order to allow the farmers of Ontario to test Lucerne upon their own farms, we have distributed seed to Ontario farmers through the medium of the Experimental Union during each of the past nine years, sufficient seed being sent some years for plots containing sixteen square rods. The reports of these experiments are furnishing most valuable information regarding the growth of Lucerne in Ontario. Those who report success are certainly in the minority, although in some cases it has been grown quite successfully. Within the past year I have received letters from upwards of one hundred Ontario farmers who have grown Lucerne upon their own farms. These replies have been received from thirty-two counties. There appears to be more Lucerne grown in the counties of Brant, Haldimand, Wentworth, Welland and Lincoln than in all the rest of the Province combined, although there is a fair amount grown in Lambton and Middlesex, and a little in some of the other counties.

Lucerne is used for green fodder, for hay, and sometimes for silage. It is also sown alone and in combination with other grasses and clovers for pasture.

We have sown Lucerne as a separate crop, and also in mixtures of grasses and clovers, on a large number of plots on our experimental grounds within the past thirteen years. We have sown it alone in the autumn and in the spring, with and without manure and with and without a grain crop. We have also sown it on soils of different elevations. The accumulating results of these experiments are becoming more valuable year by year, and should be of service to the farmers of Ontario in reaching a reliable conclusion regarding the crop. In summing up our results we find that we get an average of between 17 and 18 tons of green Lucerne per acre annually.

Great caution should be used in pasturing Lucerne or considerable loss by death of animals may be the result. From a bulletin issued by the Department of Agriculture at Washington, giving the summary results of experiments conducted throughout the United States, I make the following quotation : "It is not safe to pasture either cattle or sheep on Alfalfa, as they are liable to bloat when it is fed green. Feed them the hay or practice soiling." Within the last year, I have received reports from three different farmers in Ontario, each stating that he had lost at least one cattle beast when pasturing on Lucerne. One report states as follows : "I am well satisfied with Lucerne for hay but did not like it for pasture. After being on it about two weeks, my cows began to bloat and I lost one from this cause. I think it was from eating the tops. The cows were not left on it very long at first and did not have access to water. Last summer, instead of letting the cows on the clover, I cut it and fed it to them green, although I fed all that the cows could eat." From another letter I make another quotation : "The cows bloated a little at first when pasturing on Lucerne, and after I had them in it for six weeks I lost one from bloating." It will, therefore, be seen that great care needs to be exercised in using Lucerne alone as a pasture crop.

We have also conducted a considerable number of experiments in curing Lucerne for hay, and find, when it is cut at the right time and cured rapidly so as to retain the leaves, a good quality of hay can be produced ; in fact, we have produced hay which has been considered second to none produced on the farm. From a bulletin issued at Washington giving the summary results conducted at different Experiment Stations, I make the following quotation : "Cut Lucerne for hay when the first flowers appear. If cut in full bloom the hay will be woody and less nutritious. As Mr. Robert Harcourt, Assistant Chemist of our own Experiment Station, has been conducting an experiment by cutting Lucerne at different stages of growth and feeding the hay to sheep, some additional information of much value should be thus obtained. The Lucerne which is used was sown in the experimental grounds in the spring of 1895, and Mr. Harcourt used the crop of the fourth year for the investigations referred to.

We have sown Lucerne in at least nine different mixtures of grasses and clovers, and find that when used in a mixture the crop has been very permanent.

The results in the cultivation of Lucerne, both at our Experimental Station and throughout Ontario, should soon furnish valuable information regarding the practical side of Lucerne growing in this Province.

Sainfoin (*Onobrychis sativa*).

Sainfoin, also called Esparcette, is a perennial legume having a long root which penetrates deeply into the soil. It is mainly grown on dry calcareous soils which are either naturally or artificially well underdrained. It is grown for green fodder and for hay, and the hay is said to be better and more nutritious than that of red clover.

The seed of the Sainfoin has been sown in the Experimental department several times within the past fifteen years. As the seed of the Sainfoin loses its vitality in a short time, we find it rather difficult to purchase seed which will produce a good stand of plants. The young plants seem tender at first, and are apt to be crowded with weeds or grass unless the land is carefully looked after until the Sainfoin gets well established. The plants have proven themselves to be very hardy, and in nearly all cases have remained in the land until a change in the arrangement of the plots made it necessary to plow them up. In one plot, however, they remained for eight or ten years, holding their own throughout that length of time. The crop usually grows to a height of about two feet; and when in full bloom, the bright pink flowers are beautiful in appearance. The crop is cut for green fodder or for hay as soon as in full bloom. The average yield per acre of green fodder produced from the Sainfoin grown in our plots from seed sown in the spring of 1894, has been twelve tons. The crop is better suited for forage than for pasture. Good fresh seed should always be secured, and this shall be sown on land which is naturally dry as early in the spring as it can be worked to good advantage. The seed should be sown from an inch to an inch and a half below the surface, and may be grown with a light seeding of barley. An average of twelve tons of green Sainfoin per acre was produced from seed which was sown with about one bushel of barley per acre. This seeding of barley produced a very good crop, and was not thick enough on the ground to smother out the young Sainfoin plants.

Common Spring Vetch (*Vicia sativa*) and Hairy Vetch (*Vicia vellosa*).

For three years in succession the Common Spring vetch (*Vicia sativa*) and the Hairy vetch (*Vicia Vellosa*) have been grown under similar conditions in the Experimental department, in order to ascertain the comparative results of these two varieties in the production of green fodder. The Common Spring vetch is familiar to many of the farmers of Ontario, especially to the dairymen, who have used it in sowing with oats for the production of a green succulent food to supplement pastures during the dry part of the summer, or for making into hay for winter fodder. Common vetches have been tested over a large part of the American Continent, but seem the best adapted to Canada and to the North Eastern States.

The Hairy vetch is an annual, the seed of which was originally obtained from Western Asia. It is sown during April, May, and, June for summer forage, and in the warmer climates in August and September for winter forage. The hay produced from the Hairy vetch is of excellent quality. This variety has proved itself to be fairly well suited to the greater part of the American Continent.

The average results of the experiments conducted at the College during each of the past three years show that the Spring vetch gave a yield of green crop per acre of 1.9 tons in 1897, 3.4 tons in 1898, and 7.3 tons in 1899, or an average of 4.2 tons for the three years; and that the Hairy vetch gave a yield in green crop per acre of 12.7 tons in 1897, 7.8 tons in 1898, and 10.1 tons in 1899, or an average of 10.2 tons for the three years. These results show that the *Hairy vetch* has given an average of about two and a half times as much green fodder as the Common vetch in the average of three years' experiments. The seed of each of these two varieties of vetches was sent to experimenters throughout Ontario in the spring of 1898, and five reports of successfully conducted experiments were received. The average of these five experiments shows the Hairy vetch to have given 9 tons of green crop per acre and the Common vetch 6.9 tons of green crop per acre. It will thus be seen that the Hairy vetch has given much better results than the Common vetch in all the experiments conducted both at the College and over Ontario. Not only does the Hairy vetch produce a large yield per acre, but the crop is well suited for soiling purposes and appears to be relished by all classes of farm stock. The greatest draw back to the more extensive cultivation of the Hairy vetch in Ontario is the high

price at which the seed is sold. It may be possible, however, to obtain seed of the Hairy vetch at a much less cost in the near future. We hope to conduct more extensive experiments with the Hairy vetch in 1900 than on any former occasion, in order to glean as much information as possible in regard to this promising crop.

Tufted Vetch (*Vicia Cracca*).

The Tufted vetch, also called Cow vetch, Blue vetch, Bird vetch, and Chicken vetch, is a leguminous plant with numerous blue or purple flowers. It is grown in Europe as a fodder plant, and is specially recommended for cultivation on moist land. It is said to give excellent results when grown in shady places, as in orchards.

In each of the two years that we have tested the Tufted vetch in our plots it has grown quite successfully, producing 2.2 tons per acre one year and 3.9 tons per acre the other, making an average of a little over 3 tons per acre of the green crop. This yield was ⅘ of a ton per acre more than that produced by the Common vetch in the same period. The fodder produced was tender and succulent, and appeared to be of good quality for feeding either as a green crop or as hay. As the yield, however, is so much less than that of the Hairy vetch, we cannot recommend it at present for general cultivation, although specially mentioned by some seedsmen as affording a provender of good quality,—a claim which undoubtedly is quite correct.

Kidney Vetch (*Anthyllis vulneraria*).

The Kidney vetch is a perennial plant which belongs to the leguminous family, and is a native of Europe. It is naturally well suited to very dry and barren soils, and especially those containing much lime. It is grown on poor soil as a forage plant, and is said to produce a very palatable fodder for live stock.

The seed has been sown in our experimental plots several times, and we have usually secured a good stand of plants. In the average of two years' experiments, we obtained 3.6 tons of green crop per acre. As a rule, the crop furnishes only a small amount of forage. In some seasons there is scarcely enough to make it worth while harvesting, and we believe that it possesses no real value as a crop for Ontario, unless it is for sowing with some other crop for a permanent pasture on a very poor sandy soil.

Lupines.

Two varieties of lupines, namely, the Yellow and the Blue, were sown in our experimental plots in the spring of 1899. The germination was fairly good. The Blue variety produced plants which averaged 18.7 inches, and the Yellow variety plants which averaged 13.5 inches in height. This growth was rather better than we obtained from growing lupines on former occasions. The plants, however, were very slender and did not mature any seed. Although the plants did better this year than formerly, we cannot recommend any varieties of lupines which we have yet tested for cultivation in Ontario.

Lentil (*Ervum lens*).

The lentil is cultivated largely in Europe and furnishes a good crop for forage. The grain is very rich, and is used as food for man and for domestic animals. Calcareous soils are said to be best suited to the growth of the lentil, which is an annual legume.

We have grown lentil in our experimental grounds during the past three years, and find that it produces plants from nine to twelve and a half inches in height, which are rather delicate in growth. The crop of green fodder produced is small, and the plants seldom ripen their seed. The past results from growing lentils at the College indicate that the crop is not likely to give satisfaction in Ontario.

Serradella (*Ornithopus sativus*).

The Serradella is an annual leguminous forage plant, native of southern Europe and of northern Africa. It somewhat resembles the spring vetch in appearance, and is said to do best on moist sandy soil. The forage is about the same in composition as red

clover, and is fed to cattle and sheep. As a green manure, it is said to be specially suitable in the improvement of sterile fields. Serradella seed was sown in the experimental grounds in the spring of the present year. The plants grew to an average of seven and one-half inches in height, and the yield of green crop was at the rate of 4.7 tons per acre. The plants were low and spreading in their growth, and from the general character of the crop it would appear to be better suited as a crop for pasture or green manure than for the production of green fodder or of hay. From the study of the growth of the serradella during the past year, we would consider that its general cultivation would not prove profitable in Ontario.

Peanut (*Arachis hypogœa*).

The Peanut plant is a legume which ripens its fruit under ground. The nuts are also called groundnuts, earthnuts, groobers, etc., and are grown as a commercial article. Virginia, North Carolina and Tennessee produce a large proportion of the peanuts grown in the United States. The soil in these States seems to be specially adapted to the successful growth of this plant. It is stated that the average yield of nuts per acre is about twenty bushels.

We have tested several varieties of peanuts during the past five years with varying results. In some seasons none of the varieties have produced nuts of value, while in other seasons the yields have been fairly good from a few of the varieties. The varieties which gave the best satisfaction in each of the past three years were as follows: In 1897, the White, Red, Root Hog or Die, Spanish, and Rennie's New Canadian; in 1898, Root Hog or Die, Savatilla, Spanish, Rennie's New Canadian, and White; and in 1899. Savatilla, Root Hog or Die, Inverson's Improved, White, Spanish, and Rennie's New Canadian. These varieties are arranged according to their yield per acre, starting in each year with the heaviest yielder. By taking three years into consideration, it will be seen that the *Root Hog or Die* variety has produced the largest average yield per acre, which has been followed pretty closely by the Savatilla, Spanish and White varieties. The yield of the Savatilla in 1899 was at at the rate of 14.3 bushels per acre, but the nuts were not quite so plump as those which were used for seed. From the results of our past experiments, the indications are that some of the earliest and best varieties of peanuts can be grown to good perfection on the sandy loam soils in the warmest portions of the Province.

Flax (*Linum usitatissimum*).

The cultivation of Flax is carried on more or less extensively in a large number of the countries of the world. It has been grown to a limited extent in Ontario for its seed and for fibre. We have grown three varieties of flax in our experimental grounds during the past three years, namely, the Russian, the Manitoba, and the common Flax of Ontario. These all possess a blue flower and are much similar in character of growth, but there is a considerable difference in the size of the seed; the *Russian* variety being decidedly the largest and the common Ontario variety the smallest. In 1897 and in 1898, it was found that the Russian variety gave the best yield of seed per acre; the average being 15.6 bushels. In 1899, the experiment was not so satisfactory as in each of the two years previous, owing to the lack of the full germination of the seed on account of the exceedingly dry weather at the time of sowing and a second growth occuring after the rains came. In the average results for the three years, the Russian flax still occupies first place in yield of seed per acre.

Hemp (*Cannabis sativa*).

Hemp is supposed to be originally a native of the warmer parts of Asia, its wild locality extending from Syria to the mountains of India, in all of which districts it is met with at the present day in the natural state. It is now to be found both in a wild and in a cultivated state over the milder climates of Europe, over most of which country it is grown for its fibre and for its seed.

The subject of Hemp has not received very much attention in Ontario, but there are some enquires regarding it. Tho following quotation is taken from a letter just received from the vicinity of Leamington, Ontario: "Would you kindly give me what information you can in regard to growing Hemp. Is it grown in Canada, and where, and how is it treated for making rope? Also, do the binder twine factories use it in making twine?" We have done but little experimental work with this crop in our trial grounds. Hemp, however, has been tested in our plots for a few years, and has nearly always made a good growth. In 1899, Hemp grown on low land reached an average height of 56 inches, and that grown on high land reached an average height of 34 inches. The total crop was also considerably heavier on the low than on the high land, the yield in the former case being $3\frac{1}{2}$ tons per acre. As birds are so very fond of the seed, it is difficult to determine the amount produced on the plots. Only eight bushels of seed per acre were harvested in the past season. We hope to give this plant more attention in the future.

Ramie, Rhea, or Rhea Grass (*Bœhmeria nivea*).

Ramie is a Chinese and East India perennial shrub which is said to grow on an average from four to six feet in height. Within the last twenty years it has been grown over a considerable part of the United States, and is said to furnish a large amount of forage of fair quality, which is eaten by all kinds of live stock. It is also grown for its fibre, which is secured from the stem and which is now coming into use for almost every purpose for which cotton is used.

We have sown Ramie in our trial plots for two years, but the germination of the seed has been very poor and the results so far have been quite unsatisfactory. It is quite probable that Ramie will not prove to be a success in Ontario, although we hope to secure seed in the future which will possess greater vitality than that which we have used hitherto.

Chufas, or Earth-Almonds (*Cyperus osculentus*).

The Earth-Almond is often cultivated on rich sandy loams with good success. It is a perennial plant which produces a great many edible tubers. The cultivated variety is a very fine flavored edible nut when well dried or parched. The crop, however, is usually fed to hogs, which are turned into the field and allowed to root up the plants and eat the tubers, which are said to be very rich in fattening properties. In experiments conducted in the growing of Chufas or Earth-Almonds in our experimental department in 1897 and in 1899, we found the plants to grow well. The average yield of the tubers or nuts per acre has been 22.6 bushels.

Field Pumpkins and Field Squashes.

The following varieties of field Pumpkins and field Squashes have been tested in the experimental grounds from one to three years: Rennie's Yellow Mammoth squash, King of the Mammoth pumpkin, Thorpe's Mammoth pumpkin, Mammoth Bright Red Etampes pumpkin, Mammouth Tours pumpkin, Rennie's Green Mammoth squash, Backbee's New Sandwich Island pumpkin, Large Cheese pumpkin, Grey Boulogne pumpkin, Hundredweight pumpkin, True Potiron, Large Mammoth Yellow Chili squash, Mammoth Whale squash, Thorpe's Yankee squash. These fourteen varieties are all advertised as being heavy yielders. The varieties were grown on heavily manured, and also on unmanured, land each year. The yields from the heavily manured land were very large, as compared with those from the land which received no manure. The varieties which produced the largest yields were as follows: In 1895, the King of the Mammoth pumpkin, Rennie's Yellow Mammoth squash, Thorpe's Mammoth pumpkin, Mammoth Tours pumpkins and the Mammoth Bright Red Etampes pumpkin; in 1898, Rennie's Yellow Mammoth squash, Mammoth Bright Red Etampes pumpkin, Thorpe's Mammoth pumpkin, Grey Boulogne pumpkin and Hundredweight pumpkin; and in 1899, Thorpe's Mammoth pumpkin, Large Mammoth Yellow Chili squash, Rennie's Yellow Mammoth squash: Mammoth Bright Red Etampes pumpkin, and Large Cheese pumpkin. Taking the average results for the three years, we find that the *Rennie's Yellow Mammoth Squash* produces

the heaviest yield per acre, that the Thorpe's Mammoth pumpkin comes second, and Mammoth Bright Red Etampes third, and the King of the Mammoth pumpkin fourth.

This information should prove of service to farmers who are growing pumpkins and squashes to feed stock, as the largest yielding varieties of both pumpkins and squashes appear to be of good quality ; in fact, they are frequently used, and are considered valuable for culinary purposes, as well as for feeding to cows and hogs.

SUNFLOWER. (*Helianthus annuus*).

The Sunflower is a tall, erect, stout, rough herb, which is grown more or less over the greater part of North America. Champlain found it growing in Lower Canada, where the natives grew it for the oil which they secured from the seed. The seeds, after being shelled, are said to contain 34 per cent. of oil, of which from 28 to 30 per cent. is said to be superior to both Almond and Olive oil for table purposes ; and it is also used for making soap, candles, and for lighting. The cake which is left after the oil is extracted is used for feeding cattle. In some of the European countries the seed is used as a human food, and also as a food for sheep, pigs, and especially poultry. The flowers are used to produce a yellow dye ; the leaves as a food for cows and also as a fertilizer ; and the stalks for fuel, for fertilizing the land, and for the production of an excellent fibre when treated the same as flax.

We have grown no less than eleven varieties of Sunflowers in the Experimental department, and have found that nearly all the varieties have grown satisfactorily. The *Mammoth Russian* has been grown for seven years with an average total yield of 13.1 tons per acre. The average yield of heads of the Mammoth Russian for six out of the seven years has been 5.1 tons. The Black Giant has been grown for five years in succession, and has surpassed the Mammoth Russian variety in the total yield per acre by 1.3 tons, and in yield of heads per acre by 200 pounds in the average results for the five years. The White Beauty variety has been under experiment for the past three years, but the yield of the total crop and the yield of heads per acre have been less than those of the Mammoth Russian variety. The common Sunflower has given an average of 2½ tons of total crop per acre, and ⅘ of a ton of heads per acre less than the Mammoth Russian in the three years that these two varieties have been grown under similar conditions. The results of our experiments with Sunflowers up to the present time show that the *Black Giant* has given the largest yield per acre of total crop and also of heads, and that the Mammoth Russian occupies second place in point of yield.

CONCLUSION.

We have aimed to make all our work practical, accurate and reliable, and we hope that the record of the results here presented may be of some service in the advancement of agriculture in Ontario.

Respectfully submitted,

C. A. ZAVITZ,
Experimentalist.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, Dec., 30th, 1899.

PART XII.

MANAGER OF THE POULTRY DEPARTMENT.

To the President of the Ontario Agricultural College:

Sir,—I have the honor to submit herewith a brief report of the work, etc., in the Poultry department since the seventeenth of April last, when I commenced my duties as manager of the department.

I beg to thank you for the several improvements that have been made in our equipment during the year, especially the purchase of necessary appliances and the construction of a new incubator and brooder house. After the date at which I was appointed it was not possible to do much in the hatching of chickens. Hence there is nothing special to report under this head.

Summer Layers.

During the past season Brown Leghorns and Andalusians made the best record. The eggs from both varieties are white in color, but those from the Andalusians are much larger. The average weight of a dozen Andalusians was one pound ten ounces, while that of Brown Leghorn eggs was only one pound seven ounces. The great objection to the Andalusians is that they do not breed true to color: some are black, others mottled, and about sixty per cent. blue.

Early Winter Layers.

The Plymouth Rocks, the Wyandottes and the Langshans are doing best. They all lay medium-sized brown eggs, but the Langshan egg is the most uniform in color.

Feeding.

Morning ration.—Whole grain (wheat, barley and oats, but chiefly wheat,) scattered in the litter on the floor of the pens, care being taken that it was well mixed with the litter. The quantity fed was usually in the proportion of about one-half handful to each bird.

Noon ration.—Roots, such as mangels, sugar beets, turnips or carrots. About once a week they were cooked by way of variety.

Afternoon ration.—About 3.30 a mash, composed of equal parts bran, barley meal, ground oats, refuse bread and cut clover hay. During cold weather corn meal was given in addition. The clover hay was prepared by placing the amount thought sufficient in a vessel containing boiling water the morning previous, covering and allowing it to steam all day. The fowls were allowed what mash they would eat readily, which was about one quart to every twelve hens. If all the food was not readily eaten it was removed. Whole grain was boiled with vegetables and refuse meat, and fed as a change in the place of mash. After the mash, a small quantity of whole grain was fed in the litter to secure exercise and maintain good health. Cut bone was fed two or three times a week in the proportion of one pound to every fifteen birds. This was usually fed in the evening instead of the mash or the whole grain.

It is necessary to study the surrounding conditions as to convenience, expense, results aimed at, etc., before deciding what method of feeding will give best results.

Artificial Incubation.

Not having a proper incubating room, the manager hitherto has found the results from this method of hatching rather unsatisfactory. The machines have been operated in a small room into which the direct rays of the sun have shone, and the wooden floor of the room has been a thoroughfare from the front to the back of the main poultry building. Hence an uneven temperature, more or less jarring, and a small percentage of chickens.

Artificial Versus Natural Incubation.

Notwithstanding the unfavorable conditions, the percentage of chicks from the machines has been nearly equal to that from the hens, while much less labor has been required to care for the incubator than to look after the hens necessary to cover an equal number of eggs. A few hens have hatched the full percentage, but others have broken several of their eggs, and some have failed to remain on the nest the full twenty-one days.

Egg Preservation.

Several methods of preserving eggs were tried. The eggs for this purpose were taken early in July, and were tested during the latter part of December.

Method No. 1.—A solution was used composed of one part water-glass (sodium silicate) and six parts water. This was as strong a solution as would allow the eggs to sink and might therefore be termed a saturated solution.

The eggs from this solution were superior to all others, especially in flavor.

Method No. 2.—This was similar to that in No. 1, except that eight parts of water were used instead of six parts. These eggs were slightly inferior in flavor.

Method No. 3.—This was composed of ten parts of water to one part water-glass. The eggs from this solution were inferior to those from No. 1 both in flavor and poaching.

The results of these experiments do not coincide with those obtained by my predecessor; hence further work will be necessary before reliable conclusions are reached.

Method No. 4.—A lime solution, made as follows :

Two pounds of fresh lime were slacked in a pail and a pint of salt was added thereto. After mixing, the contents of the pail were put into a tub containing four gallons of water. This was well stirred and left to settle. Then it was stirred thoroughly the second time and left to settle; after which the clear liquid was poured over the eggs, which had previously been placed in a crock or tub. Only the clear liquid should be used.

The eggs from this pickle were inferior to those from the water-glass solution. They had a slight taste of lime.

Method No. 5.—The eggs were immersed in melted vaseline, after which they were packed in egg cases. When broken, the eggs appeared to be well preserved, but they had absorbed the very undesirable flavour of the vaseline.

Method No. 6.—Common salt was used, in which the eggs were placed, small ends downwards; and no eggs were allowed to touch the abjoining ones or the box. Only a small percentage of bad eggs was found; but they had all suffered a good deal from evaporation.

Method No. 7.—Good dry oats were used for this lot, in the same way as dry salt in No. 6. These eggs were musty, and had evaporated fully as much as those in the salt.

Method No. 8.—These eggs were immersed in pure water-glass and dried on a greased board, after which they were packed in an egg case. They were fairly well preserved, but lacked flavor.

This method necessitates a large amount of labor.

Raising Ducks.

Early in June, thirteen Pekin Ducks were hatched. These were divided into lots of six and seven each. Lot 1, six in number, were fed on a mixture of equal parts of bran, shorts, and corn meal, moistened with skim-milk. Lot 2, seven in number, were fed the same mixture, with the exception that the food was moistened with boiling water. After

the ducks were one week old, a small amount of animal meal was added to their ration. Lot 1 during the first six weeks consumed 90 lbs. of the mixture and 90 lbs. of skim-milk. They then weighed 25 lbs., or a little more than four lbs. each. Lot 2, during the same period, consumed 79 lbs. of the grain and 7 lbs of animal meal, and the lot weighed 21 lbs., or three lbs. each.

The following four weeks both lots received the ration which was fed to Lot 1. Both lots gained practically the same amount, the average weight of Lot 1 being six and one-half pounds each, and that of Lot 2, five and one-half pounds each. From this experiment it would appear that there is no advantage in mixing the food with boiling water. Before drawing final conclusions, however, it would be well to bear in mind that this is only one experiment and that it was conducted during a very warm, dry season of the year.

Fattening Chickens.

On October the thirteenth, one hundred and fifteen chickens were placed in small coops for fattening. They were carefully weighed when cooped, and again after being fed for five weeks, and the gain noted. Those of pure breeds and high crosses, representing the Plymouth Rock, Wyandottes, Brahma, and Langshan breeds, made an average gain of nearly two and one-quarter pounds each. Those representing the ordinary barnyard fowl gained only about one and three-quarters pounds each. Both lots received the same kind of food, and the general treatment was identical in every particular.

Feeding.—They were fed on a mixture of 3 parts of finely ground oats and one part buckwheat meal, moistened with skim-milk and placed in small V-shaped troughs arranged in front of the coops. They were given grit once a week and also a small feed of green cut bone. The bone appeared to have particular value in keeping the birds healthy. They were fed from the trough for four weeks, after which they were fed by means of the cramming machine for ten days. The food used in the machine consisted of very finely ground oats and skim-milk, to which was added about one pound of tallow for every seventy birds. They were allowed all the water they would drink. During the period of five weeks, the one hundred and fifteen birds consumed 910 lbs. of oats, 305 lbs. of buckwheat, 900 lbs. of skim-milk, and 9 lbs. of tallow ; and the total gain in flesh was 216 lbs.

Killing.—The birds were fasted thirty-six hours, in order to empty the crop and intestines before killing. They were killed by dislocating the neck and were immediately dry-picked. There is less work and less risk of tearing the flesh, if the plucking is done while the bird is warm.

Preparing for Market.—After being plucked the fowls were placed on the shaping board, which consists of a board about six inches wide fastened to the wall or other suitable board at an angle of about 65 degrees. As soon as plucked, the chicken was placed on this board or trough, the legs being laid alongside the breast, and the stern pushed against the wall. The breast was kept downwards and pressed into the shape of the trough by placing a glazed brick or other weight on top. When birds are left in this shape it gives them a more compact appearance and allows the blood to drain into the neck. The chickens were placed side by side in the trough and allowed to remain until thoroughly cool, when they were packed for shipment.

The crates used for packing were 33 inches long by 19 inches wide and 6½ inches deep, and usually held twelve birds. The ends and centre of the boxes were one inch thick ; the remainder of the box was five eights of an inch thick. The fowls were graded as to size. Before packing the bird should be wrapped in the best parchment paper, the neck and head projecting at one end and the feet at the other.

Feeding for Color.—Six grade Plymouth Rock pullets (full sisters) were divided into two equal lots. One lot was fed on a mixture of finely ground oats and buckwheat, which was moistened with skim-milk ; the other lot was fed on yellow corn, moistened with water. They were fed in this manner for eleven days, when they were killed and dressed. Those on the oat and skim-milk ration presented a creamy white appearance, while those fed on the yellow corn were of a deep yellow color. It will thus be seen that it is possible to supply customers of opposite tastes in regard to the color of flesh, from the same breed of fowl, by feeding different kinds of food.

Cramming Machine.

In forcing fowl for the British market, some feeders in this country and many on the other side of the Atlantic use a cramming machine during the last nine or ten days of the feeding period. Birds cannot stand it much longer.

For the information of those who have not seen such a machine I submit the following cut and description of the one which we use :

The crammer consists of a food reservoir, to the bottom of which is attached a small force pump actuated by a lever and treadle worked by the foot of the operator.

Cramming Machine.

Communicating with the pump is a nozzle, through which the food passes to the bird. A is the food reservoir. B the pump. E the pump rod. O is the lever which, on being depressed at the lettered end, causes the pump rod E, to which it is attached, to move downwards and to eject the contents of the pump B out at the nozzle K. On relieving the pressure at O, the lever and the parts connected therewith are drawn up by the spring C, until a motion is arrested by a stop M, which serves to determine the the quantity of food ejected at each depression of the treadle.

The charge may also be varied by arresting the pressure at any point in the downward thrust of the lever O.

The method of operating is as follows : Take the tube of the cramming machine in the right hand and the bird's head in the left, then with the assistance of the finger and thumb of the right hand, open the bird's mouth and slip the forefinger of the left hand into it and hold down the tongue,, quickly insert the end of the tube and push it down seven or eight inches, (according to the size of the bird), at this moment depress the right foot (which up to this time has been resting on the treadle) and force the contents of the cylinder into the bird's crop. If the crop be full enough the tube may now be withdrawn, taking care, however, to relieve the pressure on the treadle for a second or two before taking the tube out, otherwise a small quantity of food will continue to flow after the tube is removed. When not in use hang the nozzle over the edge of the food reservoir.

The advantages gained by using the cramming machine are :

(1) Birds can be made much fatter by the use of the crammer than by feeding in the ordinary way.

(2) The quality of the flesh is improved ; it is made more juicy and tender and is improved in flavor.

(3) The general appearance of the bird is improved, which is an advantage in the market.

The disadvantages are :

(1) The present cost of the machine is too high for general use. The machine for this department cost nearly thirty-five dollars. This price includes freight and duty.

(2) More labor is required in caring for the fowls when the machine is used.

(3) Inexperienced persons are apt to strangle birds by giving them too much feed or by failing to operate the machine according to directions.

(4) As a rule, ground oats require sifting before they are suitable for use in the machine, and many are so situated that they cannot get the very finely ground article.

Since writing my report, I have received from Mr. Ruddin, of Liverpool, an important communication regarding packages and the method of packing poultry for export. I believe the information given in the following letter to be of special value, considering that it comes from one of the largest and most successful dealers in England.

Liverpool, Jan. 6th, 1900.

DEAR SIR :

Owing to the disarrangement of the postal service by the "war" I have not been able to communicate with you earlier.

Your poultry is very fine ; well fed and properly handled ; and the only points on which you failed to make a complete success of your initial venture, were the packing and the cases used.

When packing your poultry in the future, use for wrapping purposes the best parchment paper obtainable. Do not on any account put straw in any of the cases, as it will attract and hold moisture and will in consequence make your birds clammy, which it did in the present lot.

If you use parchment paper and carefully cover each bird, nothing else is necessary. If the box is too large for a dozen birds, put in thirteen, fourteen, or fifteen, but always fill it up. Do not make up space by using paper, excelsior or straw.

The cases used were only suitable for hard frozen poultry, for which purpose it is desirable to have the box as nearly airtight as possible. On the other hand, chilled poultry requires cases made with inch openings left between each board that goes to make up the top, bottom, and sides.

Yours truly,

JAS. RUDDIN.

I may add that the brown paper used for wrapping was the same as that recommended by Prof. Robertson, and the boxes were made of well seasoned wood, with half inch openings between the boards. No doubt the dampness caused them to swell so as to bring them nearly together.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, Dec. 30th, 1899.

W. R. GRAHAM,
Manager Poultry Department.

PART XIII

LECTURER ON APICULTURE.

To the President of the Ontario Agricultural College:

Sir,—Herewith is submitted for your consideration my first report of the department of Apiculture.

This report, in view of the fact that I was appointed in November merely to deliver a short course of lectures occupying less than a month's time, must necessarily be confined to the work done during that period. Replying to your memorandum specifically:

I delivered 18 lectures to each division, viz., A and B, of the First Year. The lectures dealt with the following divisions of the subject:

1. Physiology of the honey bee.

2 and 3. Explanation of brood rearing.

4. The handling of bees and description of the various conditions in which colonies are expected to be found in the first week or so of May.

5. Fertile workers. Introducing queens. Building up by stimulative feeding and spreading of brood.

6. Spring flowers useful for building up. Poisoned, chilled, and foul brood.

7. The prevention of early swarming by giving ventilation and room. Returning early swarms.

8. Buying and moving bees. Preparing for clover flow. The commercial honey plants.

9 and 10. Swarming.

11, 12, and 13. The taking of extract and comb honey.

14. Storage and marketing of honey.

15. Construction of hives and appliances by bee-keepers. Building up, uniting and feeding back for wintering.

16. Cellar wintering.

17. Outside wintering. Queen rearing.

18. Resumé of the essentials of successful bee-keeping, giving each its relative importance.

Of course, there was no practical work in November or December.

From the nature of the subject I have been able to follow only in part note 3 of College Circular, p. 23. I have set a written examination in Apiculture.

Far more interest was shown in the lectures than I had expected to find. Many of the students had dabbled more or less with bees at home and were eager to obtain the information necessary for the scientific management of an apiary. From the questions asked, I should judge that they were acquiring the details with considerable accuracy. Of the remainder who had had no experience whatever with bees, several were indifferent, but the great majority really sought information. It did not appear at all to be forced upon them. Some have a pretty clear conception, and others more or less hazy impressions, on this subject, according to the capacity and interest of the student.

I have, in these lectures, detailed a simple and scientific system of bee-keeping, taking up the conditions of colonies in the beginning of the season and following them through the year; I showed what operations were to be performed and what difficulties were to be met with at each part of the season. I avoided as far as possible the division of the subject into chapters, after the manner of books, but have followed the same order as if I were handling an apiary from the beginning of the season to the end. If a student has taken full notes, he may with considerable confidence assume the responsibility of managing a few colonies during his first season. He will have at his command the little hints and scraps of information not to be found in books, and which may not be obtained in perhaps ten years' experience. The student must acquire facility in managing an apiary by several years' experience. This cannot be obtained here unless a large apiary is maintained on the Farm and the students remain at the College during the summer months.

I have furnished information to correspondents, and expect to conduct some experiments in my own apiary during the coming summer.

Respectfully submitted,

H. R. ROWSOM.

Guelph, December 18th, 1899.

PART XIV.

COLLEGE PHYSICIAN.

The President of The Ontario Agricultural College :

SIR,—A few days ago I received from you a communication requesting me to present my report for the year now ending. In performing this duty I need not make any observations to you on the marked increase of attendance at the College, with its consequent addition to the work of the physician.

You are aware that during the early part of the year the weather was exceptionally severe, and that in this section of the Province at least an unusual proportion of the population suffered from sickness, and that this condition of the public health applied to the College. In addition to the minor accidents and the many forms of slight ailments with which we had to deal, I regret to say that there occurred among the students a number of cases of rather grave illness, requiring treatment in the hospitals of this city, where under the excellent nursing of these worthy institutions all recovered : I might mention among such cases, one of pneumonia, on of severe septicaemia, one of appendicitis, and one of fracture of lower jaw.

On the occasion of my annual inspection of the College premises I noted with pleasure the improvement in the heating of the more exposed bed rooms which are further protected from cold by outside or storm windows with an aperture in the bottom of the sash for purpose of ventilation. In these rooms the warmth is now all that can be desired, but I am not sure that the ventilation is adequate.

Another matter concerning the health of the students came under my notice at that time. I refer to the condition of the swimming bath—to the need that exists there, for renewal of the present flooring or its replacement by something more suitable, for some means of preventing students from coming in contact with the heating pipes and for improved ventilation and admission of more light. In my opinion, swimming as an exercise is not fully appreciated and should be encouraged, and in connection with this matter I respectfully suggest that there be placed in conspicuous places about the bath illustrations of the best means of rescuing the drowning and resuscitating the apparently drowned.

In closing my report I am glad to say that the general sanitary condition of the College is excellent.

Respectfully yours,

W. O. STEWART,

College physician.

GUELPH, Dec. 30, 1899.

TWENTY-FIRST ANNUAL REPORT

OF THE

ONTARIO

AGRICULTURAL AND EXPERIMENTAL UNION

1899.

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TWENTY-FIRST ANNUAL REPORT

OF THE

AGRICULTURAL AND EXPERIMENTAL UNION

OF ONTARIO

1899.

To the Honorable John Dryden, Minister of Agriculture:

SIR,—I have the honor to present herewith the Twenty-first Annual Report of the Ontario Agricultural and Experimental Union.

Your obedient servant,

C. A. ZAVITZ,
Secretary.

Ontario Agricultural College,
Guelph, December 30th, 1899]

ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION.

1899-1900.

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Committees on Experimental Work.

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Horticulture - - - -	PROF. H. L. HUTT (Director), F. R. MALLORY, and C. E. WOOLVERTON.
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ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION

ANNUAL MEETING.

The Twenty-first Annual Meeting of the Ontario Agricultural and Experimental Union was held at the Ontario Agricultural College, Guelph, commencing on the evening of December 6th and closing on the afternoon of December 8th, 1899.

The Chairman for the day sessions was Mr. H. L. Beckett, B.S.A., President of the Union, and the Chairman for the evening meeting was Dr. Jas. Mills, President of the College.

PRESIDENT'S ADDRESS.

Mr. H. L. Beckett, B.S.A., Hamilton, Ont.

Once again we are met together to hold the annual meeting of the Experimental Union. Since our last meeting, another year has gone by, with all its opportunities and difficulties. Let us hope that the most has been made of the opportunities, and that the various difficulties have but spurred us on to greater achievements in the future. Unfortunately, during the past season, a large portion of the Province was visited by unusual drouth, which was severely felt, more especially by dairymen, showing that we must depend more upon the growth of soiling crops and less upon pasturing. The unusual severity of the past winter had a very disastrous effect upon the winter wheat crop, in many cases almost completely ruining it. In spite of this, however, I am happy to say that the past year has been a fairly successful one, the farmer receiving his share of the general revival of trade.

To the visitors, ex-students and students of the College, I extend a hearty welcome to this the twenty-first annual meeting of the Union, to listen to the results of the past year's work and to join in the discussions, and I hope that you may all be pleased and profited by your attendance. The Union has now attained its majority, and bids fair to fulfil its early promise of growth and usefulness. While the growth from the first has been steady, it is only comparatively recently that it has made its influence felt outside of its members and those immediately interested in such work. Now, however, things have changed. The results of the various experiments are looked forward to and carefully studied by farmers and seedsmen from one end of Ontario to the other. This is shown by the rapid introduction throughout the Province of varieties of grain and fodder crops which have proved themselves to be superior in regard to yield and hardiness, to the old and well-known varieties. In fact, the direct benefit to agriculture can scarcely be conceived. In addition to this, the experimenters themselves have received great good from the work, through the lessons they have received in accuracy, observation and carefulness. While the results have been so good in the past, there is no reason why we may not look forward to greater things in the future. The Union has now a trained corps of experimenters—men from whom good results may be expected—and the question may be asked, why should we look for more, and in many cases, no doubt, less careful ones? We must remember, however, that the experiments that are apparently conducted with the greatest accuracy and show the most reliable results are not always those that do the greatest amount of good. While for some reason or other the returns may not have been complete in every particular, still the experimenter may have had a new field opened up to him. He has been taught to think and act for himself, not to depend blindly on others. He has been taught to inquire into the reason for the success or failure of particular crops or particular varieties. He has been taught observation, and care, and accuracy in little things, which we all, as farmers, very much require to learn. And in this way the benefits may be very great, although we may never hear of them.

During the past year, agricultural experiments have been conducted upon some 3,485 farms throughout Ontario, showing a very substantial increase. In horticulture, also, the

numbers were largely in advance of former years, while the Committees in Botany and Soil Physics have not been idle. We can point with pride to our record in the past; we can look into the future with confidence that the Union will give a good account of whatever funds may be entrusted to it.

I am very pleased to say that the ex-students are showing greater interest than ever before in the work of the Union, and in this connection I might mention the fact that a donation of $25 has been received from an ex-student in England. I certainly think that greater efforts should be made in the future towards keeping up the interest of the ex-students in the Union and in the College, and in making this annual meeting a re-union to which they will look forward with expectation and remember with pleasure. The officers had hoped to have a more suitable hall for the meetings, but, unfortunately, those in authority have ordered otherwise. We will hope, however, that before another year has passed we may be better provided for in this respect.

In conclusion, let me ask you all to do your best to make this meeting the most successful in the history of the Union. Let each make it a point as far as possible to be present at all the meetings, ask questions upon any points that may not be clear, and take an active part in the discussion; and I think I can safely promise that you will go home both pleased and profited.

CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

C. A. Zavitz, B.S.A., Director of Co-operative Experiments in Agriculture, O. A. C., Guelph.

At the last annual meeting of the Experimental Union, eight different committees were appointed to plan co-operative experimental work in Horticulture, Live Stock, Diarying, Bee-keeping, Economic Botany, Economic Entomology, Soil Physics and Agriculture. The Committee on Agriculture consisted of Dr. Mills, John Buchanan, G. H. Clark and myself. I am glad to be able to say that our co-operative work in agriculture has again been successful, and in fact I believe I am justified in saying that it has been even more successful than in any year previous to 1899. We had a greater number of experimenters; we sent out more experimental material; and we have received a larger number of reports of successfully conducted experiments this year than on any former occasion. The number of distinct experiments in agriculture conducted in 1899 was twenty-three, being four more than in 1898, five more than in 1897, seven more than in 1896, and eight more than in 1895. These co-operative experiments extend into every county and district of Ontario, and we might almost say into every township, and even into every neighborhood of the Province. From the kind words which have reached us, as well as from the good reports which have been received from those who have been carrying on these co-operative experiments during the past year, we are greatly encouraged in the work and are fully convinced that a large amount of good is being derived from these experiments by the experimenters themselves and by the farmers generally.

It is very pleasing to know that those most active in the work of the Farmers' Institutes of Ontario are showing a deep interest in the co-operative experiments in agriculture. In the spring of the present year we sent copies of the following letter to the presidents and to the secretaries of the various institutes of the Province:

Ontario Agricultural College,
Guelph, March 25th, 1899.

Dear Sir,—We are much pleased with the interest which has been taken in the co-operative experiments in agriculture by those most closely associated with the Farmers' Institutes of Ontario. Co-operative experiments have been successfully conducted by no less than 67 of the present officers and 114 of the present directors of the Institutes. In many meetings which I have attended most valuable discussions have taken place on the results of the experiments conducted in the different localities. I believe that an hour or so at each Institute meeting could be devoted to discussions of this kind to great advantage to the members. I have, therefore, this year sent a circular of the co-operative experiments to each Institute officer and director in Ontario. Five extra copies are now being sent to each president, and also five extra copies

to each secretary, which must be placed in the hands of men who would likely conduct the experiments this season, and take part in the discussions in connection with your Institute meetings next winter. All applications, however, should reach here within the next ten days. The number of experimenters this year is likely to be larger than ever, as about eight hundred applications have been received within the last week. If the results of experiments conducted in different localities were published in the local papers, I believe much good would be accomplished.

I would be glad to hear from you on these points at any time.

Yours truly,
C. A. ZAVITZ,
Director.

In order to more fully understand the connection between the co-operative experimental work of the Union and the agriculture of the Province, I will first direct your attention to the number of acres used for each farm crop in Ontario in 1899, then to the nnmber of varieties of each farm crop which has been tested in the plots at the Agricultural College within the past thirteen years, and lastly to the number of varieties of each farm crop which was tested over Ontario in 1899.

FARM CROPS IN ONTARIO.

Crops.	Acres in Ontario, 1899.	Varieties Tested.	
		At O.A.C. within 13 years.	Over Ontario in 1899.
Hay and clover	2,505,422	72	8
Oats	2,363,778	218	4
Winter wheat	1,049,691	159	7
Peas	743,139	100	5
Corn	505,525	226	6
Barley	490,374	95	4
Spring wheat	398,726	144	3
Potatoes	168,148	241	6
Turnips	153,440	183	4
Rye	137,824	6	1
Buckwheat	132,082	6	3
Mangel Wurzels	53,401	102	4
Beans	40,485	41	6
Carrots	11,891	60	4

Some other crops not mentioned in the table were also distributed for co-operative testing and may be enumerated as follows :—Millets, four varieties ; sugar beets, one variety ; and leguminous crops, two varieties. Besides these varieties, material was supplied for fertilizer experiments, tests in cultivation, tests in dates of seeding, etc.

The next table shows the gradual but substantial increase in the Union experiments in agriculture for the past fourteen years.

Years.	Experiments.	Experimenters.	Satisfactory Reports.
1886	1	12	8
1888	1	90	40
1891	12	203	126
1892	12	754	295
1893	13	1,204	416
1894	14	1,440	504
1895	15	1,699	513
1896	16	2,260	501
1897	18	2,835	610
1898	19	3,028	667
1899	23	3,485	739

The best feature shown by these figures is that the number of successfully conducted experiments is increasing from year to year.

The following circular was sent out in the spring of the present year and gives the list of experiments as well as other information regarding the work :

ONTARIO AGRICULTURAL COLLEGE, GUELPH, March, 1899.

DEAR SIR,—

The members of the Committee on Co-operative Experiments in Agriculture are pleased to state that for 1899 they are again prepared to distribute into every township of Ontario material for experiments with fertilizers, fodder crops, roots, grains, grasses and clovers. Upwards of 1,000 varieties of farm crops have been tested in the Experimental Department of the Ontario Agricultural College, Guelph, for at least five years in succession. These consist of nearly all the Canadian sorts, and several hundred new varieties imported by the Experimental Department, from different parts of Europe, Asia, Africa, Australia and the United States. Some of these have done exceedingly well in the carefully conducted experiments at the College, and are now being used for co-operative experiments throughout Ontario.

This system of co-operative experimental work in Agriculture was started in 1886 with 60 plots, which were situated on 12 different farms in Ontario. Since that date, however, the work has increased from year to year, and in 1898 there were 12,357 plots, which were situated on 3,028 farms throughout Ontario.

Each person in Ontario who wishes to join in the work may choose any one of the experiments for 1899, fill out the accompanying form of application, and return the same to the Director of the Co-operative Experiments in Agriculture at as early a date as possible. The material will be furnished in the order in which the applications are received until the supply is exhausted. A sheet containing the instructions for conducting the chosen experiment, and the blank form on which to report the results of the work, will be sent to each experimenter at the time the fertilizers or seeds are forwarded. All material will be furnished entirely free of charge to each applicant, and the produce of the plots will, of course, become the property of the person who conducts the experiment. In return, the Committee desires to ask that each experimenter will sow all the plots belonging to the particular experiment which he has chosen for 1899, and that he will be very careful and accurate in his work, and forward to the Director a complete report of the results obtained from the test, as soon as possible after the plots are harvested.

All fertilizers and seeds will be sent in good time for spring seeding, providing the applications are received at an early date. The supply of material being limited, those who apply first will be surest of obtaining the desired outfit. It might be well for each applicant to make a second choice for fear the first could not be granted. The experiment selected should be indicated by using the numbers given in the left hand column in the list of experiments.

SOME ADVANTAGES OF THESE CO-OPERATIVE EXPERIMENTS.

The Union furnishes a good method by which farmers can secure pure seed of the best varieties of grain, root, fodder, silage, and hay crops to test on their own soil, and thus find out in a very practical way which special kinds are best suited to their own particular farms.

Experimental work encourages careful handling, close observation, accurate calculation, and economical methods.

Experimenters get a start in pure seeds of the best varieties of grain crops which rapidly increases in quantity, thus furnishing seed for sowing on large areas and for selling at good prices.

The co-operative experiments located on over three thousand Ontario farms form object lessons for the farmers in their respective neighborhoods.

Farmers are frequently enabled to purchase pure seed of leading varieties of grain from their neighbors who are successful experimenters.

Summary results and important conclusions from successfully conducted co-operative experiments are printed annually in the report of the Experimental Union, which is distributed in large numbers from the Department of Agriculture, Toronto, Ontario.

Important features of the experiments are frequently discussed in the field, at the fireside, and in the meetings of farmers' institutes.

Results of experiments conducted by other farmers and by the Experiment Stations are read and studied with increased interest.

Properly conducted experimental work adds pleasure to farm life, and forms a very wholesome influence in keeping the boys on the farm.

The whole system leads to a substantial increase in farm profits and to a steady advance in agricultural education throughout Ontario.

COMMENTS BY EXPERIMENTERS.

"As a result of my experiments, I grow more bushels to the acre and make more money on my farm.'

GEO. HOFF, Grey Co.

"The Experimental Union has done a grand work for Ontario. I think we have nothing in the Province that has done so much good to the farmers and to the country at large."

F. W. HEACOCK, York Co.

"I think your system is a good one. It is well conducted, is a credit to those who conduct it, and will have a bright future."—A. G. SMILLIE, Huron Co.

"I have experimented and have thus secured the varieties best suited for my own soil, and have sold seed of the best varieties to my neighbors, who have been benefited thereby."—FRANK SHUH, Waterloo Co.

"I have learned by my experiment that it may make a difference in yield of 16 bushels per acre by using one variety in preference to another."—E. M. HUSBAND, Middlesex Co.

"I have derived great benefit from the Union. By using new varieties of seed, I have more than doubled my crop."—G. W. BECKETT, Welland Co.

"I have experimented seven years, and I know that the Union is doing an incalculable amount of good for the Province. Just to give one illustration that came under my own personal observation, I wish to say that I had an experiment with barley on small plots, and from that experiment I obtained one variety called the Mandscheuri, which has been worth to the county of Glengarry alone thousands and thousands of dollars."—R. R. SANGSTER, Glengarry Co.

"By an experiment with oats, I introduced an early variety into our section, which has been of material advantage to the farmers, and is now generally grown by them."—NELSON MONTEITH, M.P.P., Perth Co.

"There are many thousand bushels of Siberian oats and of Dawson's Golden Chaff winter wheat in our locality, all grown from the experimental packages you sent me."—DAVID KIERNAN, Dufferin Co.

"Good varieties are essential to good crops."—JOHN FIRTH, Grey Co.

"The experiment actually became the leading topic of the village talk."—J. E. FRITH, Oxford Co.

LIST OF EXPERIMENTS FOR 1899.

Application of Fertilizers.

Nos.		Plots.
1.	Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure, with Corn	5
2	Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure, with Mangels	5
	Fodder Crops.	
3.	Growing Grass Peas and two varieties of Vetches for green fodder	3
4.	Growing three mixtures of grain for green fodder	3
5.	Testing six varieties of Corn for grain, fodder, or silage	6
	Hay Crops.	
6.	Testing four varieties of Millet	4
7.	Testing four varieties of Grasses	4
8.	Testing four varieties of Clovers	4
	Grain Crops.	
9.	Testing three varieties of Buckwheat	3
10.	Testing three varieties of Spring Wheat and one variety of Spring Rye	4
11.	Testing four varieties of Barley	4
12.	Testing four varieties of Oats	4
13.	Testing four varieties of Field Peas	4
14.	Testing three varieties of Field Beans	3
15.	Testing three varieties of Japanese Beans	3
	Root Crops.	
16.	Testing four varieties of Carrots	4
17.	Testing three varieties of Mangels and one variety of Sugar Beets	4
18.	Testing two varieties of Swedish, and two varieties of Fall Turnips	4
	Miscellaneous.	
19.	Sowing Peas at different dates to determine the amount of injury done by the pea weevil. (Early or late peas can be sent as desired)	4
20.	Planting Potatoes the same day and five days after being cut. (Early or late Potatoes can be sent as desired	2
21.	Planting Corn in rows and in squares. (Dent or Flint Corn can be sent as desired	2

The size of each plot in each of the first eight experiments is two rods long by one rod wide, and in each of the remaining experiments one rod square, except in experiment No. 21, when each plot is to be four rods square (1-10th of an acre).

Material for either No. 1 or No. 2 experiment will be sent by express, and for each of the others it will be forwarded by mail.

Particular varieties need not be mentioned, as the kinds to be distributed are those which have done exceptionally well for several seasons in succession in the Experimental Department of the Agricultural College.

Address all communications to

C. A. Zavitz, Agricultural College, Guelph, Ont.

We have examined all the reports which have been received, and have discarded every report which showed any sign whatever of inaccuracy. Every experimenter who did not conduct the experiment with the full amount of material; who did not use plots of exactly the right size; who did not give the yield, etc., of the different plots; or who showed any inaccuracy in his work in any way, will not find his name in the list of those whose reports were used in making up the summaries here presented. We have, therefore, included in these summaries nothing but the results which were obtained from carefully-conducted experiments. While the summaries should be of great value to the farmers generally, still those who conducted the experiments have obtained much additional information regarding the results of their experiments as adapted to their individual circumstances.

The experimenters deserve much credit in successfully conducting the various experiments during the past season; and the farmers of Ontario owe much to these experimenters for the valuable reports which they have furnished, and which are here presented in summary form.

LIST OF EXPERIMENTERS.

The following list gives the names of those who furnished satisfactory reports of carefully conducted experiments in 1899:

Experimenter.	Post Office.	County.	Experiment.
1. Smith, H. L	Jerseyville	Wentworth	Fertilizers with corn.
2. Littlejohn, R. W	Ridgetown	Kent	"
3. Jamieson, John	Meaford	Grey	"
4. Leslie, Jas	Blenheim	Kent	"
5. Brown, J. W	Chard	Prescott	"
6. McAsh, Wilson	Barnett	Huron	"
7. Green, Bismark	Oakleaf	Leeds	"
8. O. A. C	Guelph	Wellington	"
9. Wheatley, T. C	Blackwell	Lambton	Fertilizers with mangels.
10. McCracken, J. F	Bluevale	Huron	"
11. Ridgeway, P. F	Christina	Middlesex	"
12. Moss, D A	Lyons	Elgin	"
13. Brodie, Jas	Vandeleur	Grey	"
14. Watson, Mahlon	Springvale	Haldimand	"
15. Mackey, Hugh	Peterboro	Peterboro	"
16. O. A. C	Guelph	Wellington	"
17. Collinson, F	Scotia	Parry Sound	Leguminous crops.
18. Lancaster, John	Westwood	Peterboro	"
19. Krung, N. V	Dixon	Renfrew	"
20. O. A. C	Guelph	Wellington	"
21. Stringer, W. M	Dunnville	Haldimand	"
22. Shultz, H. A	Clontarf	Renfrew	Grain for green fodder.
23. Perry, Mrs. W	Bellingham	Algoma	"
24. O. A. C	Guelph	Wellington	"
25. McVannell, D	St. Marys	Perth	Corn.
26. Lamb, Lewis	Kincardine	Bruce	"
27. Brown, Louis	Norwood	Peterboro	"
28. Leighton, F. W	South River	Parry Sound	"
29. Tillson, T. D	Tilsonburg	Oxford	"
30. Carmody, John J	Siloam	Ontario	"
31. Pound, Milton	Ridgeway	Welland	"
32. Forbes, Harry	Jeannette's Creek	Kent	"
33. Beamer, Harry	Simcoe	Norfolk	"
34. Way, John C	Merlin	Kent	"
35. Clough, L. H	Hepworth	Bruce	"
36. Thompson, Hugh	Magnetawan	Parry Sound	"
37. Leavitt, A. S	Vankleek Hill	Prescott	Millet.
38. Dillon, Jas	Calabogie	Renfrew	"
39. Peck, Francis	Minden	Haliburton	"
40. Blake, Chas	Ompah	Frontenac	"
41. Kranz, N	Golden Lake	Renfrew	"
42. Hartman, Walter	Clarksburg	Grey	Grasses sown in 1897.
43. Stimpson, Fred	Lancelot	Muskoka	" "
44. Phin, H. L	Courtice	Durham	" 1898.
45. Tiegs, Theodore	Augsbourg	Renfrew	" "
46. Cranley, John, Sr	Douro	Peterboro	" 1899.
47. Green, G. E	Manitowaning	Algoma	Clovers sown in 1899.
48. Armstrong, Geo	Avonmore	Stormont	" "
49. McArthur, A. C	Martintown	Glengarry	" "
50. Musgrove, Geo. A	Walsingham Centre	Norfolk	" "
51. Rumbelow, Sam	Minden	Haliburton	" "
52. Boldt, Adolph	Kinmount	"	" 1898.
53. Ferguson, J. A	Ventry	Grey	Buckwheat.
54. Hutton, J. A	Joyceville	Frontenac	Spring wheat.
55. Abbott, Geo	Wooler	Northumberland	"
56. Robinson, T. G	Sault Ste. Marie	Algoma	"
57. Farquharson, Andrew	Woodford	Grey	"
58. Bell, Geo	Lindenwood	"	"
59. Cummings, John	Almonte	Lanark	"
60. Kelly, John	Smoky Falls	Nipissing	"
61. Thompson, Wells	Orrville	Parry Sound	"
62. Emberson, F. A	Hillside	Muskoka	"
63. Curry, Wm	Ayr	Oxford	"
64. Bennett, F. G	Spencerville	Grenville	"

List of Experimenters.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
65. Gilmour, S	Tamworth	Addington	Spring wheat.
66. Thompson, W. B	Dobbinton	Bruce	"
67. Walsh, Pat	Erinsville	Addington	"
68. Schrader, Richard	Minden	Haliburton	"
69. McLennan, R. G	Laurier	Huron	"
70. McLennan, Jas	Laurier	"	"
71. Campbell, E. B	Whitley	Lanark	"
72. Fowler, John	Mindemoya	Algoma	"
73. Sweet, Fred	Burnley	Northumberland	"
74. Summerton, Frank	Pakenham	Lanark	"
75. Lovely, J	Corbetton	Dufferin	"
76. Bancroft, G. R	Newington	Stormont	"
77. Butcher, Albert	Beaverton	Ontario	"
78. Cair, T. F	Trout Creek	Parry Sound	"
79. Morrison, David	Horning's Mills	Dufferin	"
80. Rowe, S. H	Stanwood	Northumberland	"
81. Thurman, Arthur	Yearley	Muskoka	"
82. Dawson, Peter	Bailieboro	Northumberland	"
83. Johnston, Albert	Lavender	Dufferin	"
84. Hopkin, David	Tehkummah	Algoma	"
85. Watson, Charlie	Avonmore	Grey	"
86. Ramson, W	Fergus	Wellington	"
87. Morton, Robt	Ashton	Carleton	"
88. Bender, W. W	Harrison's Corners	Stormont	"
89. Hadley, R. S	Gooderham	Haliburton	"
90. Jamieson, Alex	Glenarm	Victoria	"
91. Rolufs, R. M	Mt. Forest	Grey	"
92. Peters, Sam	Atwood	Perth	"
93. Miller, G. R. A	Vallentyne	Ontario	"
94. Haylow, Jas	Oriel	Oxford	"
95. Ferris, Wm	Horning's Mills	Dufferin	"
96. O. A. C	Guelph	Wellington	"
97. McLean, J. K	Berwick	Stormont	Barley.
98. Cornish, W. C	Little Britain	Victoria	"
99. Drimmie, Daniel	Yeovil	Grey	"
100. Craig, John	North Gower	Carleton	"
101. Stoner, L. A	Humberstone	Welland	"
102. Niece, Hosca	Stromness	Haldimand	"
103. Myers, Thos	Russell	Russell	"
104. Ross, Andrew, Sr	Grafton	Northumberland	"
105. Kelly, Richard	Alton	Peel	"
106. Finlay, Wm	Novar	Muskoka	"
107. Foulkes, Jno	Brackenrig	"	"
108. Gies, Ernest	Zurich	Huron	"
109. Simpson, Geo	Nipissing	Parry Sound	"
110. Mountain, Wm	Avonbank	Perth	"
111. Martin, E	Dunchurch	Parry Sound	"
112. Larden, Jas	Cache Bay	Nipissing	"
113. Raitby, Geo	Auburn	Huron	"
114. Walker, A	Metcalfe	Carleton	"
115. Smithrim, R. H	Cairngorm	Middlesex	"
116. Manson, Chas	Eddy Mills	Lambton	"
117. Wilson, Chas	Newmarket	York	"
118. Elliott, John E	Woodbridge	"	"
119. Gardner, W. A	Farquhar	Huron	"
120. Miller, John	Creemore	Simcoe	"
121. Carruthers, John	Mt. Bridges	Middlesex	"
122. Dickins, W. W	Hybla	Hastings	"
123. Miller, Alfred	Boxall	Elgin	"
124. Himsworth, H	Gowanstown	Perth	"
125. Last, Geo	Louise	Grey	"
126. McCall, T. H	Petrolia	Lambton	"
127. Rowand, W. A	Walkerton	Bruce	"
128. Akhurst, A	Greenbank	Ontario	"
129. Callaghan, Jas	Reaboro	Victoria	"
130. Patterson, R	Kirkwall	Wentworth	"
131. Ross, John	Ilderton	Middlesex	"
132. Walker, Thos	Hawthorne	Carleton	"

LIST OF EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
133. Eaton, Thos	Byng	Haldimand	Barley.
134. Johnson, H	Nanticoke	Haldimand	"
135. Monkman, R. R	Castlederg	Peel	"
136. Lane, John	Gore Bay	Algoma	"
137. Taylor, Daniel	Massey	Grey	"
138. McCormick, W. R	Powassan	Parry Sound	"
139. McCormick, J. F	Trenton	Northumberland	"
140. Stroud, J. H	Powell's Corners	Victoria	"
141. Reed, D. H	Mimosa	Wellington	"
142. Willison, Thos	Mount Wolfe	York	"
143. Acklan, Robert	Mitchell	Perth	"
144. Newton, J. F	Violet Hill	Dufferin	"
145. Johnston, J., Jr	Lavender	Dufferin	"
146. Percival, W. A	Burritt's Rapids	Grenville	"
147. O. A. C	Guelph	Wellington	"
148. Macfie, C. M	Appin	Middlesex	"
149. Laing, W. J	Motherwell	Perth	Oats.
150. Detwiller, B	Motherwell	Perth	"
151. Holmwood, Geo	Guelph	Wellington	"
152. Dalton, Robert	Victoria Harbor	Simcoe	"
153. Macdonald, M	Lucknow	Huron	"
154. Johnston, Jas	Lavender	Dufferin	"
155. Lee, Edward	Bracebridge	Muskoka	"
156. Wilson, John	Marsville	Dufferin	"
157. Slade, Geo	South End	Welland	"
158. Baxter, J	St Paul's Station	Perth	"
159. Watson, W. J	Malton	Peel	"
160. Coutts, Jas	Ufford	Muskoka	"
161. Peppler, C	West Montrose	Waterloo	"
162. Baird, Geo	Clinton	Huron	"
163. Vary, Ira	Hepworth	Bruce	"
164. Bennett, S. G	Midland	Simcoe	"
165. McAulay, Walter	Bellingham	Algoma	"
166. Pratt, Wm	Penetanguishene	Simcoe	"
167. Martin, W. J	Udney	Ontario	"
168. Wilson, S. J	St Catharines	Lincoln	"
169. Cragg, A. F	Cambray	Victoria	"
170. Elder, B	Peabody	Grey	"
171. Campbell, J. S	Komoka	Middlesex	"
172. Turner, Geo	Aspdin	Ontario	"
173. Semple, W. C	Tottenham	Simcoe	"
174. McAfee, Thos	Rocklyn	Grey	"
175. Edmonston, John	Hoath Head	Grey	"
176. McLellan, John	Forrester Falls	Renfrew	"
177. Brook, Wm	Ashworth	Muskoka	"
178. Bryne, Thos	Kinmount	Victoria	"
179. Duffield, Archie	Bunessan	Grey	"
180. Frame, John	Walkerton	Bruce	"
181. Coffey, Wm	Arkwright	Bruce	"
182. McCrie, W. A	Durham	Grey	"
183. Bennett, C. E	Rodney	Elgin	"
184. Darling, Jas	Mildmay	Bruce	"
185. Johnston, David	Navan	Russell	"
186. McCaskill, Alex	Barb	Prescott	"
187. Bruce, W. G	Inverary	Frontenac	"
188. Virtue, Henry	Vandeleur	Brant	"
189. Dixon, W. L	Dromore	Grey	"
190. Reid, Sam	Thornloe	Nipissing	"
191. Haight, P. C	Wellington	Prince Edward	"
192. Fawell, L. A	DeCewsville	Haldimand	"
193. Bain, J. R	Loring	Parry Sound	"
194. Lain & Sons, R. E	Lanes	Huron	"
195. Bateman, T. M	Empey	Hastings	"
196. Hayward, Robert	Kearney	Parry Sound	"
197. Lyons, Jas. S	Ceylon	Grey	"
198. Jennings, John, Jr	Barry Island	Algoma	"
199. Gillies, Donald	Cambray	Victoria	"
200. Cornish, Wesley	Little Britain	Victoria	"

LIST OF EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
201. Fielding, David	Coningsby	Wellington	Oats.
202. Dunn, W. J	Mt. St. Louis	Simcoe	"
203. Jack, John	Corbetton	Dufferin	"
204. Christie, S. W	Martintown	Glengarry	"
205. Dool, Sam	North Rideau	Carleton	"
206. Stonehouse, Geo	Fraserburg	Muskoka	"
207. Maguire, R. G	Rydal Bank	Algoma	"
208. Laidlaw, D. A	Blyth	Huron	"
209. Richmond, John	Blyth	Huron	"
210. Hammill, E. P	Walter's Falls	Grey	"
211. Barton, Jas	Charleyville	Grenville	"
212. Benson, J. W	Eugenia	Grey	"
213. Gringrich, E	Preston	Waterloo	"
214. Pettigrew, Jas	Barrow Bay	Bruce	"
215. Musclow, Chas	Bancroft	Hastings	"
216. Loveley, Isaac	Corbetton	Dufferin	"
217. Cordukes, Thos	Sowerby	Algoma	"
218. Robertson, R. J	Plainville	Northumberland	"
219. Phillipson, John	Palmerston	Wellington	"
220. Merritt, L. A	St. Catharines	Lincoln	"
221. Smith, Robert	Monkton	Perth	"
222. Ney, Wm	Elliott's Corners	Simcoe	"
223. Petapiece, G. E	Manotick	Carleton	"
224. Caldwell, Hugh	Clydesdale	Peterboro	"
225. Medd, David	Dresden	Lambton	"
226. McIlwain, J. W	Heather	Lambton	"
227. Henry, Chas. E	Sombra	Lambton	"
228. Cummings, W. J.	Spencerville	Grenville	"
229. Anderson, G. B	Medina	Oxford	"
230. Hartley, E. E	Milton	Halton	"
231. Wood R T	Thistletown	York	"
232. Sherk, J M	Selkirk	Haldimand	"
233. Bond, Thos	Chesterfield	Oxford	"
234. Sloan, Wm	Connor	Simcoe	"
235. Kaiser, Morden	Sunnidale Corners	Simcoe	"
236. Wood, Daniel	Crumlin	Middlesex	"
237. Pritchard, T	Richard's Landing	Algoma	"
238. Walker, Henry	Haysville	Waterloo	"
239. McKnight, Wm	West Port	Leeds	"
240. Trace, John	Elmvale	Simcoe	"
241. Patterson, Jas	Strathroy	Middlesex	"
242. Burns, Simon	Rutherford	Lambton	"
243. Carmichael, Arch	West Lorne	Elgin	"
244. Henderson, T. S	Rockton	Wentworth	"
245. Rose, John	Alliston	Simcoe	"
246. Campbell, C. H	Strathroy	Middlesex	"
247. Day, Nathan	Ridgeway	Welland	"
248. Braden, R. H	Lakefield	Peterboro	"
249. Waterworth, John	Woodgreen	Middlesex	"
250. Ward, H. G	Big Fork	Algoma	"
251. Tuck, Wm	Coulson	Simcoe	"
252. Stokes, Duncan	Mount Albert	Ontario	"
253. Kidd, S. L	Listowel	Perth	"
254. Reid, Thos	Eganville	Renfrew	"
255. Simpkins, S. L	Melrose	Hastings	"
256. Boutellier, F. P	Belle River	Essex	"
257. Longmuir, John	St. Ola	Hastings	"
258. Bogle, John F	Strabane	Wentworth	"
259. Matheson, Wm	Donegal	Perth	"
260. Askin, Thos	Allenford	Bruce	"
261. Miller, Andrew	Wroxeter	Huron	"
262. Boyd, Wm	Hopetown	Lanark	"
263. Whiles, Mrs. Alice	Scotia	Parry Sound	"
264. Burke, Wm., Jr	Purple Valley	Bruce	"
265. Speiran, John	Henfryn	Huron	Peas.
266. Windatt, John D	Gamebridge	Ontario	"
267. Fell, Wm	Orillia	Simcoe	"
268. Eastwood, John	Tarbert	Dufferin	"

LIST OF EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
269. Servos, A. D. K.	Niagara	Lincoln	Peas.
270. Stroh, G. R.	Conestoga	Waterloo	"
271. Byers, Thos.	Williamsford	Grey	"
272. Hutt, F. A.	South End	Welland	"
273. Moffatt, J. S.	Bognor	Grey	"
274. McNee, Arch.	Ennotville	Wellington	"
275. O'Connor, Jas	Renfrew	Renfrew	"
276. Kidd, C.	Cookstown	Simcoe	"
277. Fraser, W. R.	Bluevale	Huron	"
278. Swain, W. R.	Valentia	Victoria	"
279. Grady, Jas W.	Annan	Grey	"
280. Feeley, Thos.	Eganville	Renfrew	"
281. Burkholder, P. C.	Tapleytown	Wentworth	"
282. Robinson, John	Hepworth Station	Bruce	"
283. Turnbull, Edward B.	Brewster	Huron	"
284. Pugh, Jos. D.	Milverton	Perth	"
285. Isaac, Jas.	Dromore	Grey	"
286. Atkinson, D. S.	Boston Mills	Peel	"
287. Scott, Robt.	Malvern	York	"
288. Brown, D. A.	Lobo	Middlesex	"
289. Bewester, O. L.	Horning's Mills	Dufferin	"
290. Tracey, S. S.	Grenfel	Simcoe	"
291. Stoneman, Wm. J.	Maple Lake	Parry Sound	"
292. Clare, G. H.	Chapman	Hastings	"
293. Bradley, Miles	Restoule	Parry Sound	"
294. Misener, C. C	Darling Road	Haldimand	"
295. Gorrell, G. H	Gore Bay	Manitoulin	"
296. Gilmour, Matthew	Doe Lake	Parry Sound	"
297. Real, J. M.	Greenbank	Ontario	"
298. Warren, W. J.	Pembroke	Renfrew	"
299. Kitchen, E. W.	Lovering	Simcoe	"
300. Grant, W. M.	Woodville	Victoria	"
301. Gadd, Thos.	Varney	Grey	"
302. Hulbig, John	Minden	Haliburton	"
303. Stephenson, J. N.	Ingersoll	Oxford	"
304. Clark, J. W.	Onondaga	Brant	"
305. Duncan, Geo. S.	Cayuga	Haldimand	"
306. Wilson, J. F.	Walmer	Oxford	"
307. Hunter, John	Wyoming	Lambton	"
308. Peskett, F. L.	Owen Sound	Grey	"
309. Craven, W. J.	Shelburne	Dufferin	"
310. Craven, M. A.	"	"	"
311. Brooks, R. A.	North Port	Prince Edward	"
312. Lormie, A. B.	Orland	Northumberland	"
313. Munro, John	Clifford	Huron	"
314. Grasby, Harry	Durham	Grey	"
315. Finley, Walter	Novar	Muskoka	"
316. Stacey, Thos.	Bluevale	Huron	"
317. Reid, R. H	Reaboro	Victoria	"
318. Paterson, Robt.	Belton	Middlesex	"
319. Wilson, Chas.	Snelgrove	Peel	"
320. Kehoe, John	Coventry	"	"
321. Forsyth, Asa	Uxbridge	Ontario	"
322. Howell, T. F.	Brantford	Brant	"
323. Drummond, Jackson	Connor	Simcoe	"
324. Eriskine, Thos.	West Lorne	Elgin	"
325. Naftel, C. J. S.	Goderich	Huron	"
326. McDermid, P. H	Martintown	Stormont	"
327. Warren, W. R.	Gamebridge	Ontario	"
328. Allen, Daniel	Chesley	Bruce	"
329. Peter, Harold	Atwood	Perth	"
330. Miller, Jas. S.	Parry Harbor	Parry Sound	"
331. Beckett, Geo. W.	Effingham	Welland	"
332. McDermid, H. R	Martintown	Stormont	"
333. McVety, Wm.	Seaforth	Huron	"
334. Miller, Jas.	Vallentyne	Ontario	"
335. Martin, R. B.	Elmira	Waterloo	"
336. Regan, M.	Crathie	Middlesex	"

List of Experimenters —*Continued.*

Experimenter.	Post Office.	County.	Experiment.
337. Fischer, A. H	Molesworth	Perth	Peas.
338. Alexander, Jas.	Milton	Halton	"
339. Brown, Thos. T.	Thistletown	York	"
340. Hines, Wm. H.	Ashworth	Muskoka	"
341. Richardson, Robt	Wyoming	Lambton	"
342. Osborn, J. H	Utterson	Muskoka	"
343. Watson, John	Port Perry	Ontario	"
344. Broom, John	Forrester's Falls	Renfrew	"
345. Jones, Isaac	Broadbent	Ontario	"
346. Hawkins, Wm., sr.	Alton	Peel	"
347. Siegner, E.	Mildmay	Bruce	"
348. Partridge, J. W.	Crown Hill	Simcoe	"
349. Strachan, Thos.	Brussels	Huron	"
350. Cullis, Fred.	Vandeleur	Grey	"
351. Crawford, D. S.	Purple Valley	Bruce	"
352. Trachsell, S. M.	Shakespeare	Perth	"
353, McMurchy, John	Erie	Norfolk	"
354. O. A. C.	Guelph	Wellington	"
355. Greaves, John E.	Dromore	Grey	Beans.
356. Robins, Allen	Boyle	Monck	"
357. Westney, Stephen	Pickering	Ontario	"
358. White, Clement	Colinville	Lambton	"
359. Jull, J. R.	Mt Vernon	Brant	"
360. Doud, F. B.	Branchton	"	Japanese beans.
361. Miller, Simon	Unionville	York	"
362. Neilson, Jno. D	Thedford	Lambton	"
363. O. A. C.	Guelph	Wellington	"
364. Trimble, T. B.	Tapleytown	Wentworth	Carrots.
365. Brennan, E. A.	Orillia	Simcoe	"
366. Shelly, E. A.	Colgan	"	"
367. Robson, Alfred	Norwood	Peterboro	"
368, Hundt, John A	Carlsruhe	Bruce	"
369. Dodge, Wm.	Uttoxeter	Lambton	"
370. Tinney, J. D	Oakwood	Victoria	"
371. Phippen, Francis	Port Sydney	Muskoka	"
372. Matheson, N. E.	Donegal	Perth	"
373. Barrett, Chas. E.	Marsville	Dufferin	"
374. Powell, H. O.	Brockville	Leeds	"
375. Hodge, G. T.	Stanleydale	Muskoka	"
376. McBride, John	Mono Mills	Dufferin	"
377. Binnie, Geo.	Bunessan	Grey	"
378. Smith, J	Ridgeway	Welland	Mangels and sugar beets.
379. McCullough, H. A.	Nantyre	Simcoe	"
380. Young, John	Waubuno	Lambton	"
381. Cross, J.	Caledonia Springs	Prescott	"
382. Little, Joseph	Fairholme	Parry Sound	"
383. Hull, G. S.	Kerwood	Middlesex	"
384. Lunn, Thomas	Burtch	Brant	"
385. Shearer, Charles E.	Vittoria	Norfolk	"
386. Leak, E. G	Woodslee	Essex	"
387. Julian, Geo	Heathcote	Grey	"
388. Hamilton, Miller	Athlone	Simcoe	"
389. Hildreth, Samuel	Tapleytown	Wentworth	"
390 Robertson, James	Apto	Simcoe	"
391. Downey, Orland	Castlederg	Peel	"
392. Turnbull, Robert	Brewster	Huron	"
393. Gatecliffe, Geo	Oil Springs	Lambton	"
394. Wilson, Thos	Gore Bay	Algoma	"
395. Kidd, John	Stafford	Renfrew	"
396. Taylor, Thos. P	Burford	Brant	"
397. Dunn, J. A	Wooler	Northumberland	"
398. McCreath, Mat	Kincardine	Bruce	"
399. Sutherland, Herbert	Strathroy	Middlesex	"
400. Scissons, Thomas	Dunrobin	Carleton	"
401. Campbell, P. M	Balderson	Lanark	"
402. Farmer, W. E	Lake Talon	Nipissing	"
403. Belleby, Martin	Camperdown	Grey	"
404. Carmody, Wm	Siloam	Ontario	"

LIST OF EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
405. Martin, Joseph	Amherstburg	Essex	Mangels and sugar beets.
406. Mark, Leslie	Oakwood	Victoria	"
407. Knox, W. A.	Belgrave	Huron	"
408. Falkingham, Wm	Edge Hill	Grey	"
409. Mooney, Wm	Paisley	Bruce	"
410. O. A. C.	Guelph	Wellington	"
411. Poff, John	Greenview	Hastings	"
412. Hallman, Josiah.	Washington	Waterloo	Turnips.
413. E. A. B. Proctor	Bunyan	Lambton	"
414. A. W. Westgate	Watford	"	"
415. O. A. C.	Guelph	Wellington	"
416. Dickin, John	Milton	Halton	Injury done by weevils.
417. Scarf, Thos	Rocky Saugeen	Ontario	"
418. O. A. C.	Guelph	Wellington	"
419. Blazer, E	Rye	Parry Sound	Preparation of seed potatoes.
420. Irving, J. C.	Cherry Valley	Prince Edward	"
421. Proudfoot, James	Fenaghvale	Prescott	"
422. Stephens, Thos. W.	Aurora	York	"
423. Wright, John H	Stewartville	Renfrew	"
424. Scarf, Wm	Aberdeen	Grey	"
425. Haid, Nicholas	Hesson	Perth	"
426. Haines, Wm. F.	Parry Sound	Parry Sound	"
427. Shepherd, Frank	Pickering	Ontario	"
428. Adolph, Louis	Wallace	Perth	"
429. Wilson, John	Utterson	Muskoka	"
430. Pegg, James	Kolapore	Grey	"
431. Jacobs, Henry	Parkersville	Muskoka	"
432. Stevenson, E. H.	Renfrew	Renfrew	"
433. Thomas, C. E.	Novar	Muskoka	"
434. Kilfoyle, Milton	Mud Creek	Lanark	"
435. Weir, Alex. S	Utterson	Muskoka	"
436. McBain, J. W.	Atwood	Perth	"
437. Woods, Michael	Woodington	Simcoe	"
438. Patton, Chas, Jr	Heckston	Dundas	"
439. Davison, Wm. H	Paisley	Bruce	"
440. Smith, James	Edgar	Simcoe	"
441. Middleton, Chas	Mount Hope	Bruce	"
442. Compton, Geo	Aspdin	Muskoka	"
443. Heaven, Claude C	Oakville	Halton	"
444. Harsett, P. B	Mt. Forest	Grey	"
445. McLeod, Andrew	Napanee	Lennox	"
446. Creighton, J. C	Hawley	"	"
447. Rock, James	Hutchinson	Middlesex	"
448. McFayden, John H.	Durham	Grey	"
449. McColl, Arch	Aldboro	Elgin	"
450. Kirk, Geo. H.	Codrington	Northumberland	"
451. Scott, Richard	Powassan	Parry Sound	"
452. Moir, James	Sundridge	"	"
453. Tinney, John D	Oakwood	Victoria	"
454. Atkinson, F. W.	Strathroy	Middlesex	"
455. Colwell, Samuel	Carholme	Norfolk	"
456. McPherson, G. L	Puslinch	Wellington	"
457. Butcher, S. J	St. Catharines	Lincoln	"
458. Bell, J F.	Leamington	Essex	"
459. Oke, W. J.	Hay	Huron	"
460. Dolrymple, Alex.	Dunnville	Haldimand	"
461. Eask, W	Sutton West	York	"
462. Cundish, Albert	Sombra	Lambton	"
463. Hutchinson, J. H.	Gooderham	Peterboro	"
464. Brodie, J. F.	Pt. Cockburn	Parry Sound	"
465. Duncan, Alex	Springbank	Middlesex	"
466. Cooper, Chas	Attercliff	Haldimand	"
467. Grierson, James	Toronto	York	"
468. Barber, T. E	Rossmore	Prince Edward	"
469. Brown, Ed	Huntsville	Muskoka	"
470. Patterson, Walter S.	Belton	Middlesex	"
471. Shields, W. M	O'Connell	Ontario	"
472. Patton, Thomas G.	Oakville	Halton	"

LIST OF EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
473. Stewart, A	Ailsa Craig	Middlesex	Preparation of seed potatoes.
474. Parkinson, Wesley	Elimville	Huron	"
475. Irvine, Wm	Habermehl	Grey	"
476. Turner, Wm H	Ridgetown	Kent	"
477. Brenton, Joe	Corbyville	Hastings	"
478. Revel, Geo	Orillia	Simcoe	"
479. Henry, John	Sylvan Valley	Algoma	"
480. O'Connor, P. H	Fingal	Elgin	"
481. Clapp, W. S	Rose Hall	Prince Edward	"
482. Brown, D. M	Strathroy	Middlesex	"
483. Stokes, Wm. R	Sombra	Lambton	"
484. Hymess, Geo. E	Beaver Mines	Algoma	"
485. Rose, James B	Black Heath	Wentworth	"
486 Adams, Dudley	Cardinal	Grenville	"
487. Haid, Edward	Hesson	Perth	"
488. Mackie, Jas.	Mt. Dennis	York	"
489. Russell, W. H	Essex	Essex	"
490. Jackson, W. J	Playfair	Lanark	"
491. Hoar, Wm	Myrtle	Ontario	"
492. Meads, Edward	Axe Lake	Parry Sound	"
493. Wadsworth, Albert	White Bread	Lambton	"
494. Vining, Ebenezer	Thorndale	Middlesex	"
495. Hicks, Henry M	Lochlin	Haliburton	"
496. Sheil, John J	Ariel	Parry Sound	"
497. Kerfoot, John J.	Minesing	Simcoe	"
498. Gilmour, David	Hampden	Grey	"
499. Knight, Thos. W	Brackenrig	Muskoka	"
500. Gale, F	Lake Talon	Nipissing	"
501. Shuh, Frank	Waterloo	Waterloo	"
502. Pearce, W. H	Newcastle	Durham	"
503. Alton, G. W	Houghton Centre	Norfolk	"
504. Bray, Daniel	Huntsville	Muskoka	"
505. Ridler, T	Fort William	Algoma	"
506. Stroh, W... R	Conestoga	Waterloo	"
507. Hubbard, J. S	Ravenscliff	Muskoka	"
508. Kincaid, Peter	Peabody	Grey	"
509. Pearson, P. W	Aurora	York	"
510. Abbott, Francis G.	Lucan	Middlesex	"
511. Willsie, Jacob.	Thedford	Lambton	"
512. Skinner, Thomas	Croton	Kent	"
513. Schuter, M.	Chepstow	Bruce	"
514 Fisher Bros	South Middleton	Norfolk	"
515. Graham, David	Sutton West	York	"
516. Henderson, John	The Ridge	Hastings	"
517. Taylor, A. J	Glencoe	Middlesex	"
518. Hamilton, Robert N.	Russell	Russell	"
519. Cragg, Thos. H	Croton	Kent	"
520. James, G. M	Waterford	Norfolk	"
521. Kitchen, Jos	Huntsville	Muskoka	"
522 Adams, W. J	Dromore	Grey	"
523. Brown, Alfred	McLean	Frontenac	"
524. Blyth, G. J	Chatsworth	Grey	"
525. Anderson, A. D	Keene	Peterboro	"
526. Krick, G. E.	Elcho	Monck	"
527. London, J. B	Lansdowne	Leeds	"
528. King, N	Marsville	Dufferin	"
529. Smailes, John	Eagle	Elgin	"
530. Gale, W. T	Lake Talon	Nipissing	"
531. Simpson, Wm	Ridgetown	Kent	"
532 Whiteside, T	Corbett	Huron	"
533. Hughson, Richard.	Dresden	Kent	"
534. Dunn, James	Sundridge	Parry Sound	"
535 Wells, Peter	Jura	Lambton	"
536. Rae, Alex	Invermay	Bruce	"
537. Shirreff, Benjamin	Allenford	"	"
538. Beatty, David	Chapman	Hastings	"
539. Shannon, M	Centreville	Addington	"
540. Hilborn, Howard	Bosworth	Wellington	"

LIST OF EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
541. Scoffin, W. J	Uttoxeter	Lambton	Preparation of seed potatoes.
542. McKinnon, D. C	Fawn	Ontario	"
543. Munger, A. T.	Hallow	Essex	"
544. Huffman, W. G	Gilead	Hastings	"
545. Scott, R. B	Seaforth	Huron	"
546. Manson, J. A	Blake	"	"
547. Salisbury, Sam. N.	Moira	Hastings	"
548. Egglesfield, L. W	Sault Ste. Marie	Algoma	"
549. Jinkinson, S. A	Ashton	Carleton	"
550. Knight, Thos., Jr	Rodney	Elgin	"
551. Madden, Alex	North Williamsburg.	Dundas	"
552. Steele, Abel.	Ferguson	Middlesex	"
553. Challis W. J	Thamesville	Kent	"
554. Cahoon, Nelson	Picton	Prince Edward	"
555. Haight, Carniff	Bloomfield	"	"
556. Marjerrison, Wm	Apple Hill	Glengarry	"
557. Moulding, R. J	Sundridge	Parry Sound	"
558. Werry, H. J	Enniskillen	Durham	"
559. Firth, John	Edge Hill	Grey	"
560. Hodge, Percy	Stanleydale	Muskoka	"
561. Armstrong, W. E	"	"	"
562. Hewton, Wm	Hope Bay	Bruce	"
563. Dick, Roland	Mabee	Norfolk	"
564. Black, J. F	Gleneden	Grey	"
565. Hill, John H	Woodstock	Oxford	"
566. Kitson, John T	Stayner	Simcoe	"
567. McNair, J. D	Cranbrook	Huron	"
568. Carter, Jas	Athol	Glengarry	"
569. Inkster, Wm. F	Wareham	Grey	"
570. Williams, John	Shelburn	Dufferin	"
571. Greenaway, Allie	Cambray	Victoria	"
572. Hall, Johnston	Keady	Grey	"
573. File, C. E	Napanee	Lennox	"
574. Lawson, Jas. T	Kearney	Parry Sound	"
575. Marquis, Wesley	Holmesville	Huron	"
576. Young, John	Chepstow	Ontario	"
577. Clarridge, H. C	Brampton	Peel	"
578. Cochrane, Wm	Brussels	Huron	"
579. Shields, Peter	Amberly	"	"
580. Whetter, F. A	Lorneville	Victoria	"
581. Whetter, J. R	"	"	"
582. Weale, W. R	Albury	Prince Edward	"
583. Stevens, J. H	Bartonville	Wentworth	"
584. Keppy, Wm	Spence	Parry Sound	"
585. Swan, Geo	Stanleydale	Muskoka	"
586. Drummond, Geo. A	Connor	Simcoe	"
587. Burnham, L. V	Sombra	Lambton	"
588. Swan, J. H	Stanleydale	Muskoka	"
589. Dunnell, Jno	Bayview	Grey	"
590. Russell, Jas. W	Blairton	Peterboro	"
591. Macphee, Hugh	Crewe	Huron	"
592. Armstrong, Jno	Avonmore	Stormont	"
593 Dorland, A. M	Bloomfield	Prince Edward	"
594. Filson, Henry	Stella	Lennox	"
595. Richardson, Howard	Huntley	Carleton	"
596. Markley, Wm	Irena	Dundas	"
597. Wilson, Jas	Peterboro	Peterboro	"
598. Arnold, F	Kent Bridge	Kent	"
599. Orser, W. H.	Wilberforce	Haliburton	"
600. Munro, Angus, Sr	Powassan	Parry Sound	"
601. McLeod, D. A	Brooksdale	Oxford	"
602. Forrester, John	Port Elgin	Bruce	"
603 Keefer, J. G	Norwood	Peterboro	"
604. Ritchie, Alex	Inverary	Frontenac	"
605. Cubben, H	Kinmount	Victoria	"
606. Dale, Richard B	Chatham	Kent	"
607. Davis, Farwell	Foxboro	Hastings	"
608. Baxter, J	St. Paul's	Perth	"

List of Experimenters—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
609. Sebber, Geo	Ingersoll	Oxford	Preparation of seed potatoes.
610. Neil, J. F	West McGillivray	Middlesex	"
611. Marshall, Dan	Allenford	Grey	"
612. Remmer, Enos	Pickering	Ontario	"
613. Sproull, Thos	Dayton	Algoma	"
614. McLean, L	Watford	Lambton	"
615. Menzies, Jas. B	Molesworth	Huron	"
616. Smyth. J. P	Huntsville	Muskoka	"
617. Bray, W. H	"	"	"
618. Smith, W. B	Fruitland	Wentworth	"
619. Hill, Geo. & Son	Port Hope	Durham	"
620. McAsh, John	Varna	Huron	"
621. Preston, J J	Oliphant	Bruce	"
622. Lidgett, Edward	Kinsale	Ontario	"
623. McKellar, A	Kertch	Lambton	"
624. Westington, W. J.	Plainville	Northumberland	"
625. Benson, John J	Brookholm	Grey	"
626. Wilson, John	Utterson	Muskoka	"
627. Hubbert, Jas	Allandale	Simcoe	"
628. Watson, T. H	Sonya	Victoria	"
629. Calvert, A. E	Mandaumin	Lambton	"
630. Ferrill, Wm	Albury	Prince Edward	"
631. Thomas, F. A	Novar	Muskoka	"
632. Sollitt, W. S	Uxbridge	Ontario	"
633. Graham, J. A	Moonstone	Simcoe	"
634. Roulston, W. D	Garnet	Norfolk	"
635. Quinn, Andrew	Listowel	Perth	"
636. Sutherland, A. B	Medina	Oxford	"
637. Otis, W	Springford	"	Hilled and drilled corn.
638. Traviss, Herbert	Queensville	York	"
639. Smith, H. F	Iroquois	Dundas	"
640. Brown, Wm	Morley	Grey	"
641. Smith, Jas. E	Iroquois	Dundas	"
642. McKenney, Hugh	Corinth	Elgin	"
643. Richard, G. F	Ravenscliff	Muskoka	"
644. Way, W. J	Merlin	Kent	"
645 Davis, W. J	Saintsbury	Middlesex	"
646. O. A. C	Guelph	Wellington	"
647. Shantz, A	Waterloo	Waterloo	Potatoes.
648. Whiteside, A. E	O. A. C., Guelph	Wellington	"
649. Dean, H H	"	"	"
650. McCrimmon, J. R	Vankleek Hill	Prescott	"
651. Goble, F. W	Woodstock	Oxford	"
652. Ross, H. R	Gilead	Hastings	"
653 Forbes, C. W	Jeanette's Creek	Kent	"
654. Pickett, B	Vittoria	Norfolk	"
655. Raynor, T. G	Rose Hall	Prince Edward	"
656. Dolson, W. J	Chatham	Kent	"
657. Silcox, F. H	Iona	Elgin	"
658. Ross, D. A	Martintown	Glengarry	"
659. Wilson, Jas	Whitechurch	Bruce	"
660. Black, W. J	Stanton	Dufferin	"
661. Humphrey, Geo	Troy	Wentworth	"
662. Campbell, J. A	Simcoe	Norfolk	"
663. Lick, Elmer	Oshawa	Ontario	"
664. Putnam, G. A	O. A. C., Guelph	Wellington	"
665. O. A. C	Guelph	"	"
666. Naftel, C. J. F	Goderich	Huron	Winter wheat, set 1.
667. High, A L	Jordan	Lincoln	"
668. Osborne, Jos	Wyoming	Lambton	"
669 Night, Chas. H	Cranbrook	Huron	"
670. Russell, W. W	Uhthoff	Simcoe	"
671. Brown, Simeon	Rosedene	Lincoln	"
672. Gray, Alexander	Marksville	Algoma	"
673. Querengener, Chas	Broadhagen	Perth	"
674. Allen, Daniel	Chesley	Bruce	"
675. Moses, George	Avonton	Perth	"
676. Shannon, Fred	Elsinore	Bruce	"

LIST OF EXPERIMENTERS—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
677. Loucks, Gordon	Minden	Haliburton	Winter wheat, set 2.
678. McKay, Alex	Middleville	Lanark	"
679. Dickson, Andrew	Drumbo	Oxford	"
680. Moore, Quinten	Bobcaygeon	Peterboro	"
681. Callaghan, Jas	Reaboro	Victoria	"
682. Trachsel, Gilgian	Shakespeare	Perth	"
683. Bailey, Wm. H	Torrance	Simcoe	"
684. McDonald, R	Wiarton	Grey	"
685. Carrol, Jno	Joynt	Wright, P. Q	"
686. Jones, Richard	Elimville	Huron	"
687. Wrathell, F	Harper	Lanark	"
688. Atkinson, Dean	Boston Mills	Peel	"
689. O. A. C	Guelph	Wellington	"
690. Hulbig, John	Minden	Haliburton	"
691. McKenner, Timothy	Dornoch	Grey	"
692. Wagg, G. C	Stouffville	York	"
693. McKenzie, D	Kincardine	Bruce	"
694. Shultz, H. A	Clontarf	Renfrew	"
695. Lamb, J. T	Walkerton	Bruce	"
696. Horner, Franklin	Mimico	York	"
697. Walker, J. E	Kinmount	Haliburton	"
698. Nisbett, H. G	Lakehurst	Peterboro	"
699. Rolufs, R. M	Mount Eorest	Grey	"
700. Waddell, A, J	North Osgoode	Carleton	"
701. Alexander, George	Allen Park	Grey	"
702. Hill, Wm	Clifford	Bruce	"
703 Gray, Daniel	Marksville	Algoma	"
704. Storry, Levi	Wareham	Grey	"
705. Bacon, Wm	Orillia	Simcoe	"
706. Ion, Arthur	Barwick	Ontario	"
707. Brent, Jos	Adelaide	Middlesex	"
708. Flint, Arthur	Cottam	Essex	"
709. Koehler, Louis	Waterloo	Waterloo	"
710. Williams, W. E	Clandeboye	Middlesex	"
711. Eaton, Thos'	Byng	Haldimand	"
712. Johnson, Joshua	Trowbridge	Perth	"
713. Porterfield, Jas	"	"	"
714. Letherland, Robert	Seaforth	Huron	"
715. Brodie, James	Vandeleur	Grey	"
716. Moore, Wm	Bobcaygeon	Peterboro	"
717. Tompkins, Levi	Dundonald	Northumberland	"
718. Smith, Archie	Southcote	Wentworth	"
719. Wells, E	Canning	Oxford	"
720. Middleton, Chas	Mount Hope	Bruce	"
721. Curry, I	Echo Bay	Algoma	"
722. Wilkinson, G. W	"	"	"
723. O. A. C.	Guelph	Wellington	"
724. McLean, Alex.	Peabody	Grey	Winter wheat, set 3.
725. Triebner, Frank	Exeter	Huron	"
726. Wood, Alex.	Villiers	Peterboro	"
727. Wheatley, Thos	Clarksburg	Grey	"
728. Anderson, Geo. B	Medina	Oxford	"
729. Carmichael, Duncan	West Lorne	Elgin	"
730. Davis, C. G	Truman	Halton	"
731. Moore, Jas	Greenock	Bruce	"
732. Kerr, Russell	Clavering	Grey	"
733, Hord, Jas.	Ilderton	Middlesex	"
734. Blight, John	The Grove	"	"
735. Ramage, Wm	Dromore	Grey	"
736. Keffer, Jas. H	Sherwood	York	"
737. O. A. C	Guelph	Wellington	"

REPORTS OF EXPERIMENTS.

The instructions for conducting each experiment as well as the summary results of each successfully conducted test and the conclusions therefrom are here presented.

No. 1—Testing Nitrate of Soda, Superphosphate, Muriate of Potash, Mixture, and no Fertilizer with Corn.

1. Upon uniform land which has received no manure for at least four years, mark off five plots, each two rods long by one rod wide.
2. Mark out each plot into ten rows one way by five rows the other way, allowing 3 feet 4 inches between the rows.
3. Sow the different fertilizers as indicated by the labels on the packages.
4. Plant 6 kernels of the Salzer's North Dakota Corn at each of the places where the lines touch, and thus make fifty hills on each plot.
5. When the plants are about 4 inches tall, thin out to 4 plants per hill.
6. Cut the corn before it is injured by frost.
7. Weigh the whole crop from each plot as soon as cut, and then husk, weigh and count the ears, and examine the condition of the grain.

No. 2.—Testing Nitrate of Soda, Superphosphate, Muriate of Potash, Mixture and no Fertilizer with Mangels.

1. Upon uniform land which has received no manure for at least four years, mark off five plots, each two rods long by one rod wide
2. Leave a path 3 feet wide between each two plots.
3. Make 8 drills, 25 inches apart and 2 rods long in each plot.
4. Sow the different fertilizers as indicated by the labels on the packages.
5. Sow the Carter's Champion Yellow Intermediate Mangel seed as evenly as possible on the five plots.
6. Thin the young plants when about 3 inches tall to a distance of 10 inches apart in the drills, and leave 316 roots in each plot.
7. Again count the plants when about 8 inches tall, and, if necassary, remove a few of the plants from some plots in order that the number of roots on the different plots will be exactly the same.

Fertilizers.	Quantity of fertilizer used per acre.	Cost of fertilizers used per acre.	Average yield per acre.						
			Bushels of oats, 5 yrs., 74 tests.	Tons of mangels.		Tons of corn.			
						Total crop.		Ears.	
				1899, 8 tests.	Average 3 years, 27 tests.	1899, 8 tests.	Average 3 yrs., 31 tests.	1899, 8 tests.	Average 3 yrs., 26 tests.
	lbs.	$							
No fertilizer	....	....	38.90	23.98	19.54	8.52	7.29	1.91	3.16
Nitrate of Soda	160.0	3.52	46 30	26.85	24 32	9.70	8.40	2.35	3.54
Muriate of Potash......	160.0	3.84	43.80	25.20	22.33	9.17	8.39	2.10	3.68
Superphosphate	320.0	3.36	43 60	25.83	22 62	9.51	8.12	2.38	3.65
Mixed fertilizer..........	213.3	3.67	48.70	24.68	22 84	9.65	8.40	2.17	3.72

For the five years, 1892, 1893, 1894, 1895 and 1896, co-operative experiments were conducted throughout Ontario by testing commercial fertilizers with oats, and in 1897, 1898 and 1899 by testing the same kinds and qualities of fertilizers with mangels and with corn. Both the fertilizers and the seed were weighed and done up separately and sent from the College to the experimenters during each of the eight years. Nitrate of Soda and Muriate of Potash were each used at the rate of 160 pounds per acre; superphosphate at the rate of 320 pounds per acre, and the complete fertilizer at the rate of 213⅓ pounds per acre. The complete fertilizer was composed of Nitrate of Soda, Muriate of Potash, and Superphosphate, in the proportions of 1, 1, and 2 by weight. The Nitrate of Soda was applied when the plants were about two inches in height, and the Muriate of Potash and Superphosphate at the time of sowing the seed.

Conclusions.

1. The unfertilized land gave a less yield than the fertilized land in each of the years and with each of the three crops—oats, mangels and corn.

2. On some soils the application of fertilizers had but little influence, and on others it about doubled the yields of the crops.

3. The summary results from the application of the fertilizers show that the largest average yield was produced by sowing the complete fertilizer with oats; the nitrogenous fertilizer with mangels; and the potassic, nitrogenous, or complete fertilizer with corn.

4. The largest average increases in yields of crops per acre from using the fertilizers were as follows: 9.8 bushels of oats from sowing 213⅓ pounds per acre of the mixed fertilizer, costing $3.57, or 36.4 cents for each extra bushel produced; 1.1 tons of corn from sowing 160 pounds per acre of Muriate of Potash, 160 pounds of Nitrate of Soda, or 213⅓ pounds of Mixed Fertilizer, costing $3.84, $3.52, and $3.57 respectively, or $3.49, $3.20, or $3.25 for each extra ton produced; and 4.78 tons of mangels from sowing 160 pounds per acre of Nitrate of Soda, costing $3.52, or 73.6 cents for each extra ton produced.

No. 3.—Growing Three Leguminous Crops for Green Fodder.

1. Prepare for sowing all the packages of seeds upon three uniform plots, each plot being exactly two rods long by one rod wide.
2. Drive wooden stakes at the four corners of each plot and leave a clean path three feet wide between each two plots.
3. When the land becomes sufficiently warm in the spring, run a strong cord around each plot, and sow the different packages upon their respective plots and inside of the cord.
4. After the plants are up two or three inches, run a cord around each plot and cut off every plant outside of the cord.
5. The Grass Peas and the Tares should be cut as soon as the pods are one-half grown, and the green crop from each plot should be weighed immediately after being cut.
6. Feed the green crops separately to farm animals and take notice of which varieties are liked the best.

Varieties.	Length of plants, —inches.	Tons per acre. 5 tests.
Hairy Vetch	41	9.0
Common Vetch	29	6.9
Grass Peas	25	5.1

The Hairy Vetches, Common Vetches and Grass Peas are all leguminous crops and therefore, like clover and peas, are valuable as nitrogen gatherers. The seed of Hairy Vetches was brought from Russia to the United States in 1886. The crop is used for green fodder, for hay, or for plowing under as a green crop.

Conclusions.

1. Each of the three crops grown was fed to horses, cattle and sheep by the different experimenters and seemed to be generally relished.

2. The Grass Peas gave a larger average yield of green crop than the Common Tares in the co-operative experiments of 1898 and of 1897.

3. Crimson Clover, which was included in the experiment of 1897, and again in 1898, was discarded this season owing to the poor record which it made throughout the Province.

No. 4.—Testing Three Mixtures of Grain for Green Fodder.

1. Prepare for sowing the packages of seeds upon three uniform plots, each plot being exactly two rods long by one rod wide.
2. Drive wooden stakes at the four corners of each plot and leave a clean path three feet wide between each two plots.
3. Run a strong cord around each plot and sow the different packages upon their respective plots and inside of the cord.

4. After the peas are up two or three inches, again run the cord around each plot and cut off every plant outside of the cord.
5. The crops should be cut as soon as the heads are well out and the grain is in the milk stage, and immediately weighed in the green condition.

Mixtures.	Comparative value by experimenters. 4 years.	Yield per acre.—tons.	
		1899. 3 tests.	Average 4 years. 23 tests.
Oats, 1½ bushels per acre; Peas, ½ bushel per acre; Tares, ½ bushel per acre	85	6.97	8.72
Oats, 1½ bushels per acre; Peas, 1 bushel per acre	100	6.10	8.20
Oats, 1½ bushels per acre; Tares, 1 bushel per acre	76	6.94	7.89

For four years in succession, an experiment has been conducted throughout Ontario by using three mixtures of grain for the production of green fodder; oats and peas forming one mixture; oats and tares, another; and oats, peas and tares, the third. The Siberian Oats, Prussian Blue Peas and common tares or vetches were used for the experiments.

Conclusions.

1. Oats and peas produced the largest yield of green crop per acre in 1896 and in 1898; and oats, peas and tares, the largest yield in 1897 and in 1899.

2. Oats and peas formed the most popular mixture for green fodder in the experiments of 1896, 1897, 1898 and 1899.

3. Either oats and peas, or oats, peas and tares, mixed in the proportions as used in this experiment, produces a good crop to use for green fodder.

No. 5—Testing Six Leading Varieties of Corn.

1. Prepare for sowing all the varieties upon six uniform plots, each plot being exactly 1 rod (16½ feet wide by 2 rods (33 feet) long.
2. Mark out each plot into five rows one way by ten rows the other way, allowing 3 feet 4 inches between the rows.
3. Plant each variety of corn upon its respective plot. Drop six kernels at each of the places where the lines touch, and thus make fifty hills of each variety.
4. When the corn is about 4 inches high, thin out to four plants per hill.
5. Cut each variety before frost, and at the time when its stage of growth corresponds to the roasting condition of field corn, or when the grain is partly glazed. Weigh the whole crop from each plot as soon as cut, and then husk, weigh, and count the ears, and examine the condition of the grain.

Varieties.	Average condition of grain at time of cutting.	Height of Crop, (ins.)	Yield per acre—tons.	
			Ears, 7 tests.	Whole Crop, 12 tests.
Mammoth Cuban, Yellow Dent	Dough (74)	106	2.8	14.3
Mastadon, Yellow Dent	Firm Dough (82)	101	2.8	13.5
Wisconsin Earliest, White Dent	Dough (74)	94	2.8	12.0
Salzer's North Dakota, White Flint	Ripe (100)	89	2.6	11.2
King Philip, Reddish Flint	Ripe (100)	84	2.7	10.0
Stowell's Evergreen, Sweet	Dough (70)	82	2.5	10.0

The varieties of corn sent out for co-operative experiments in 1899 include some of the best of the large, the medium, and the small varieties, and represented the dent, the flint, and the sweet classes.

Conclusions.

1. In the co-operative experiments over Ontario in 1899 the Mammoth Cuban and Mastadon Dent appeared to be adapted to the conditions of Southern Ontario, the Wisconsin Earliest White Dent to Southern and Central Ontario, and the Salzer's North Dakota and the King Philip to Central and Northern Ontario.

2. That variety of corn which will produce the largest total yield per acre and the largest yield of grain per acre among the varieties that will mature in any locality before the leaves become frozen is one of the best corns for that locality.

3. The three varieties of dent corn gave the heaviest yield of green corn per acre, and the one variety of sweet gave the lowest yield ; the two varieties of flint corn holding an intermediate position in yield of whole crop.

4. Each of the two varieties of flint corn was earlier in reaching maturity than any of the dent varieties.

5. The individual experiments show that no one variety of corn is well suited to all parts of Ontario.

No. 6—Testing Four Leading Varieties of Millet.

1. Upon soil prepared as for corn, sow all the varieties upon four uniform plots, each two rods long by one rod wide.

2. Drive wooden stakes at the four corners of each plot and leave a clean path three feet wide between each two plots.

3. Run a strong cord around each plot and sow the different varieties upon their respective plots and inside of the cord. Aim at seeding one inch deep.

4. After the plants are up 2 or 3 inches, again run the cord around each plot and cut off every plant outside of the cord.

5. The crops should be cut as soon as the heads are in appearance, and immediately weighed in the green condition.

Varieties.	Estimated Value 2 years.	Tons per acre—green hay.	
		1899 5 tests.	2 years 10 tests.
Japanese Panicle	100	4.4	6.4
Japanese Barnyard	72	3.7	5.9
Hungarian Grass	62	4.0	4.8

There were four tests with millet in 1892, two in 1892, two in 1893, five in 1894, five in 1895, and four in 1896. The average results from the five years showed that the Salzer's Dakota gave 7.7 tons, Golden Wonder 6.5 tons, and the Common millet 5.2 tons per acre. Three varieties of Japanese millet have been introduced more recently and they have made high records at the College. Two of these Japanese millets and the Hungarian grass have now been under comparative tests over Ontario in each of the past two years.

Conclusions.

1. For two years in succession, the Japanese Panicle millet has given a larger yield of crop per acre than either of the other two varieties of millet under test.

2. The Japanese Panicle variety of millet was a favorite with the experimenters in each of the past two years.

3. The Hungarian grass gave an average of 1.6 tons of crop per acre less than the Japanese Panicle millet in the average of two years' experiments over Ontario.

No. 7.—Testing Four Varieties of Grasses for Hay.

1. Measure off four uniform plots, each one rod square, in a position that they may remain undisturbed for a number of years.
2. Drive wooden stakes at the four corners of each plot and have a clean path three feet wide between each two plots.
3. Run a strong cord around each plot and sow the different varieties upon their respective plots and inside of the cord.
4. Sow one half pound of some kind of spring grain on each plot at the same time that the other seeds are sown, and then rake the ground well.
5. After the grain is up four inches again run the cord around each plot, and cut off every plant outside of the cord.
6. Cut the grain when ripe, and remove it from the plots at once.
7. Again run a cord around each plot, and trim off the edges of the plot as evenly as possible.
8. Any weeds growing in the plots should be pulled out by hand or cut out by the spud.

Varieties.	Height 1st season, 3 years, (inches).	Tons of hay per acre. 2nd season, 2 years. 6 tests.	3rd season, 1 year. 2 tests.
Tall oat grass	11.8	3.0	2.3
Timothy	6.3	2.7	2.1
Orchard grass	10.8	2.0	1.6
Meadow Fescue	10.2	2.2	1.3

No farm crop grown in Ontario occupies a larger area of land than that used for the production of the grasses and clovers. A large amount of experimental work has been carried on at the College in testing the various kinds of grasses which have been obtained in Ontario and elsewhere. In 1897, four varieties were carefully selected from all those that had been grown at the College, and these were forwarded to those persons who wished to test them on their own farms. In each of the past two years the same varieties of grasses were again sent out. Each experimenter was asked to have his plots so located that he could leave them undisturbed for several years. We hope, therefore, to obtain some valuable information from these experiments after they have been conducted for a few years in succession.

Conclusions.

1. In the second year after seeding, each variety of grass produced an average of two tons or over of hay per acre; the tall oat grass giving the highest and the orchard grass the lowest yield.

2. The tall oat grass produced the greatest average height of crop in the first year, and the largest average yield of hay in both the second and the third years after seeding.

3. Of the four varieties under experiment, the tall oat grass produced the longest average length of plants in each of the first, second, and third years after seeding.

No. 8.—Testing Four Varieties of Clovers for Hay.

(For "Instructions," see experiment No. 7.)

Varieties.	Height 1st season, 3 years, (inches).	Tons per acre—2nd year. Green hay. 6 tests.	Dry hay. 7 tests.
Mammoth Red	9.2	7.3	3.6
Common Red	7.3	6.0	2.4
Alsike	6.8	5.6	2.4
Lucerne	7.8	5.3	2.0

For three years in succession we have sent out seed of four varieties of clover for co-operative experiments. As with the grasses, the results for the first year after seeding are of but little value. The crop from the different varieties in the second year, however, supplies valuable date regarding the varieties under test. When the test is repeated for several years in succession, the accumulative results of the tests should supply information of considerable value.

Conclusions.

1. In average yield of hay per acre in the second year after seeding, each variety of clover gave two tons or upwards per acre; the Mammoth Red giving the highest and the Lucerne the lowest yield.

2. In the average of all the experiments with clover, the Mammoth Red produced the tallest growing crop in both the first and the second years after seeding.

3. The average yield of hay per acre from the four varieties of clover was forty-three per cent. as great as the average yield of freshly cut grass.

No. 9.—Testing Three Varieties of Buckwheat.

1. Prepare for sowing all the varieties upon three uniform plots, each plot being exactly one rod square
2. Drive wooden stakes at the four corners of each plot and leave a clean path three feet wide between each two plots.
3. Run a strong cord around each plot and sow the different varieties upon their respective plots and inside of the cord.
4. After the plants are up two or three inches, again run the cord around each plot and cut off every plant outside of the cord.
5. The crops should be cut as soon as they ripen, and when dry, weighed and threshed by flail immediately on being brought in from the heat of the sun, and then the grain should be weighed by itself.

Varieties.	Average height, 3 years.	Yield of grain per acre, (bushels).	
		1899. 1 test.	Average 3 years. 12 tests.
Japanese	33.2	24.2	23.3
Silver Hull	31.9	21.7	22.4
Common Grey	29.4	21.7	21.4

For three years in succession three varieties of buckwheat have been used for the co-operative experiments, and we now have the reports of twelve successfully conducted tests. There is not much interest taken in the growing of buckwheat in Ontario, as shown by the fact that there were about fourteen thousand acres less devoted to the crop in Ontario in 1899 as compared with that of 1898.

Conclusions.

1. In the co-operative experiments and in the experiments conducted at the College, the Japanese variety of buckwheat has given the largest, the Silver Hull variety the second largest, and the Common Grey variety the lowest yield of grain per acre.

2. There is a difference of about two bushels per acre between the average yield of the Japanese and of the Common Grey varieties of buckwheat throughout Ontario for the three years during which this experiment has been in progress.

3. The average yield of buckwheat per acre in the co-operative experiments for the past three years was as follows: 1897, 21.3 bushels; 1898, 16.5 bushels; and 1899, 22.5 bushels.

No. 10.—Testing Three Varieties of Spring Wheat and One of Spring Rye.

(For "Instructions," see experiment No. 9.)

Varieties.	Estimated value.	Yield per acre.	
		Straw. (tons). 31 tests.	Grain. (bushels). 43 tests.
Wellman Fife	100.0	1.7	23 5
Rio Grande	72 8	1.6	20.5
Herison Bearded	62.0	1.6	19.3
Spring Rye	41.3	1.3	19.0 (60 lbs.) 21.4 (56 lbs.)

The demand for new varieties of spring wheat has been quite keen during the past five years, but previous to that period there was a gradual decline in the interest shown in this crop. In each of the past three years, spring rye was sent out along with the three varieties of spring wheat and the results of the experiments with the four crops are embodied in the one table. As the standard weight per measured bushels of spring wheat is 60 pounds and of spring rye is 56 pounds, we have reckoned the yield per acre of the rye by using both standards of weight for the convenience of comparing the results.

Conclusions.

1. The average yield of the spring wheat was considerably higher in the Union experiments for 1899 than in those of 1898, while the yield of the spring rye remained more constant.

2. The Herison Bearded variety of spring wheat gave the largest average yield of grain per acre in twenty nine co-operative experiments in 1893, nineteen in 1894, thirteen in 1895, and eighteen in 1896; and gave the second largest average yield of grain per acre in thirty-one co-operative experiments in 1897, and sixty-eight in 1898, but in 1899 it gave only the third largest average yield of grain per acre in forty three tests.

3. In the co-operative experiments for 1899, the Wellman Fife variety of spring wheat possessed the stiffest and the spring wheat the weakest straw.

4. The spring rye and the Wellman Fife spring wheat produced straw with the least amount of rust and the Herison Bearded and the Rio Grande produced straw with the largest amount of rust in the Union tests of 1899.

5. The Wellman Fife variety of spring wheat has been grown at the Agricultural College for eight years in succession, and stands at the head of the list in average yield of grain per acre of the eight varieties which were grown in 1892 for the first time and have been tested each year since.

No. 11. Testing Four Leading Varieties of Barley.

(For "Instructions" see experiment No. 9.)

Varieties.	Estimated value.	Yield per acre.	
		Straw (tons) 41 tests.	Grain (bus.) 51 tests.
Oderbrucker	100.0	1.4	41.5
Mandscheuri	90.2	1.3	38.7
Success	60.1	1.1	34 2
Black Hulless	51.0	1.3	32 5 (48 lbs.) 26.0 (50 lbs.)

For the barley experiment, four varieties were sent out, two of which were among the very best of the six-rowed class; one was a leader of the hulless class; and the other was one of the best representatives of the beardless class. As the standard weight per measured bushel of the barley in Ontario is forty-eight pounds, and as the hulless varieties usually weigh about 60 pounds per measured bushel, we reckoned the yield of the black hulless by using both weights per measured bushel. This will afford a better chance for comparing the different varieties one with the other.

CONCLUSIONS.

1. The Mandscheuri barley has given the largest average yield of grain per acre in the comparative test for each of the years 1892, 1893, 1894. 1895, 1896, 1897 and 1898, and the second largest average yield of grain per acre in 1899.

2. The Oderbrucker barley has given the second largest average yield of grain per acre in the conparative test for each of the years, 1892 1893, 1895, 1896, 1897 and 1898, and the largest average yield of grain per acre in 1899.

3 In 1899 the Oderbrucker and the Mandscheuri varieties of barley had the least rust and the Success and the Black Hulless the most rust in the experiments over Ontario.

4. In 1899 the Oderbrucker and the Mandscheuri varieties of barley possessed the stiffest and Black Hulless the weakest straw.

5. In the average results of tests made on fifty-one Ontario farms in 1899, the Success variety of barley was surpassed in yield of grain per acre by 7.3 bushel in the case of the Oderbrucker variety and 4.5 bushels per acre in the case of the Mandscheuri variety.

No 12. TESTING FOUR LEADING VARIETIES OF OATS.

(For "Instructions" see experiment No. 9.)

Varieties.	Estimated value.	Yield per acre.	
		Straw (tons) 101 tests.	Grain (bus.) 117 tests.
Siberian	100.0	1 7	55.7
Bavarian	85 4	1.7	53.6
Joanette	62.9	1.5	51.8
Poland White	66.9	1.5	49.0

According to the report of the Bureau of Industries, the area devoted to the growing of oats in Ontario in 1899 was 2,363 778 acres. This is greater than the area given to any other crop in Ontario except to grasses and clovers. We have grown two hundred and eighteen varieties of oats at the Agricultural College within the past thirteen years in order to find out the most promising varieties. From this long list of varieties and from our extensive experimental work with this crop, we have been enabled to make an excellent selection for co-operative work throughout Ontario.

CONCLUSIONS.

1 The Siberian variety of oats occupied first place in yield of grain per acre in the average results of one hundred and twenty-five experiments in 1892, one hundred and five experiments in 1893, one hundred and twenty-one experiments in 1894, seventy-eight experiments in 1895, one hundred and six experiments in 1898, one hundred and seventeen experiments in 1899; and it occupied second place in this respect in 1896 and in 1897.

2. The Joanette occupied third place in yield of grain per acre in each of the years 1892, 1893, 1894, 1895 and 1899, and fourth place in each of the years 1896, 1897 and 1898.

3. The Bavarian variety of oats, which stands second in yield per acre in the co-operative experiments in 1899, occupies the highest place in average yield of grain per acre among all the *Ontario* varieties grown at the experimental farm for ten years in succession.

4. The Siberian has the least and the Bavarian had the most rust of the four varieties in the experiments in 1899.

5. The Bavarian and the Siberian had the stiffest straw, and the Joanette the weakest straw in the Union experiments of the past year.

No. 13.—Testing Four Leading Varieties of Peas.

(For "Instructions," see experiment No. 9.)

Varieties.	Estimated value.	Yield per acre.	
		Straw (tons) 79 tests.	Grain (bushels) 90 tests.
Early Britain	96.4	1.2	28.1
Chancellor	94.2	1.3	27.5
Prussian Blue	100.0	1.5	27.2
Striped Wisconsin Blue	62.5	1.5	25.2

The Early Britain variety of peas was imported from England in 1899 and has made a high record as a yielder in the experiments at the College since that time. The peas are brown in color and the straw is shorter than in several of the other varieties.

The English seed firm under the name of Kamm & Co. addressed a letter, dated 30th November, 1898, to the curator of the Imperial Institute, London, England, in reference to Canadian peas. This letter was forwarded to the Ontario Department of Agriculture. From this letter I take the following extract: "We should recommend that the Canadian farmer should grow the so-called Wisconsin peas which is produced across his frontier in large quantities which give general satisfaction. We enclose type of this variety. It fetches a better price than the usual Canadian blue pea, and we could do with large quantities of it." In a letter sent from Mr. Mitchell, of the Canadian Government Agency at Liverpool, England, to the Hon. John Dryden, Toronto, we take the following: "I beg to suggest that experiments be made with the samples that are being sent, so that the attention of the Canadian Agriculturist may be directed to the advantages they may be found to possess. There is no doubt that English buyers would prefer to purchase Canadian produce rather than that from the United States of a similar article that can be exported from the Dominion."

We have grown the Wisconsin Blue pea in our experiments at Guelph during each of the past eight years and included it as one of the varieties for co-operative experiments over Ontario in 1899.

Conclusions.

1. The Early Britain has given the largest average yield of grain per acre in the co-operative experiments over Ontario in each of the past four years.

2. The Prussian Blue variety gave the largest average yield of grain per acre in the co-operative experiments in 1893 and in 1894; second largest in 1895 and 1897; third largest in 1898 and in 1899, and the fourth largest in 1896.

3. The Wisconsin Blue variety of peas gave a yield of grain of two bushels per acre less than the Prussian Blue variety, and about three bushels per acre less than the Early Britain variety.

4. The Prussian Blue was the most popular and the Wisconsin Blue was the least popular with the experimenters in 1899.

3 The average length of straw produced by the different varieties in 1899 was as follows: Prussian Blue, 50 inches; Wisconsin Blue, 48 inches; Chancellor, 42 inches, and Early Britain, 38 inches.

6. The Chancellor variety produced the best quality of straw and the Early Britain the poorest quality according to the reports of the experimenters.

No. 14.—Testing Three Varieties of Beans.

1. Prepare for sowing all the varieties of beans upon three uniform plots, of exactly the same shape and size.
2. Each plot may consist of (*a*) eight rows 16 feet 6 inches long; (*b*) four rows 33 feet long; (*c*) two rows 66 feet long.
3. The rows should be twenty-five inches apart.
4. Plant the beans six inches apart in the rows, thus using 264 beans of each variety.
5. When the young plants are about four inches tall, count the number on each plot, and if necessary pull a few plants in some of the plots in order to have exactly the same number of plants remaining of each variety.
6 The plants of each variety should be pulled and counted as soon as they ripen, and when dry threshed by flail immediately on being brought in from the heat of the sun, and the grain weighed.

Varieties.	Estimated value.	Relative size.	Bushels per acre. 6 tests.
Medium or Navy	100	53	21.3
Marrowfat	71	100	20.2
White Wonder	77	43	16.1

In 1899, three varieties of Canadian beans were selected for the Union experiment No. 14 The large, medium, and small classes of beans were all represented by using one of the very best varieties of each class.

Conclusions.

1. The White Wonder variety of beans did not do as well over Ontario in 1899 as it did in 1898.

2. The Marrowfat beans are about twice as large as the Medium or Navy beans and about two and one-half times as large as the White Wonder beans.

3. The average height of the three varieties of beans was as follows: Marrowfat, 18 inches; Medium, 16 inches; and White Wonder, 12 inches.

No. 15.—Testing Three Leading Varieties of Japanese Beans.

(For "Instructions" see experiment No. 14.)

Varieties.	Estimated value.	Yield per acre.	
		Straw. (tons). 4 tests.	Grain. (bushels). 4 tests.
Medium Green	72	2.6	22.4
American Coffee Berry	[illegible]	1.4	21.3
Extra Early Dwarf	86	1.1	12.7

The Soy beans (Glycine hispida) is a leguminous plant native of Japan and China, and ranks very high from a chemical point of view. The plant is an annual, erect in growth and branches profusely. There are a large number of varieties, nearly all of which are too late for the conditions of Ontario. The different varieties are distinguished largely by the time required for the plants to mature and by the color of the seed; the yellow, the green, and the black, being the most common. The Soy beans are used for

green fodder, silage, hay, pasture, and as a soil renovator, and the grain is used as a feed for live stock. These beans have been used as a food for man from the earliest times in Japan and China, and more recently in the European countries. They are not used as a food by themselves, but are made into different complex forms, of which five are quite common among the Japanese, namely: natto, tofo, miso, yuba, shoyu.

Conclusions.

1. The Soy beans gave very good results in the Union experiments in 1899.

2. The medium green Soy beans which gave the largest yield of grain per acre of the three varieties tested over Ontario in 1899, is the latest of the three varieties.

3. The American Coffee Berry was the most popular variety with the experimenters when yield, time of maturity, etc., were all taken into consideration.

No. 16.—Testing Four Leading Varieties of Carrots.

1. Prepare for sowing all the varieties upon four uniform plots, of exactly the same shape and size.
2. Each plot may consist of (*a*) eight drills, 16 feet 4 inches long; or (*b*) four drills, 32 feet 8 inches long; or (*c*) two drills, 65 feet four inches long.
3. The drills should be twenty-five inches apart.
4. Sow all the seed of each variety as evenly as possible.
5. Thin out the young plants in the drills to an average of ten inches apart, leaving 396 roots of each variety.
6. Again count the plants when about 8 inches tall, and if necessary, remove a few of the plants from some plots in order that the number of roots on the different plots will be exactly the same.

Varieties.	Estimated value.	Tons per acre. 14 tests.
Pearce's Imported Half Long	100	26 6
Large White Belgian	76	26.2
Guerande	76	22 6
Danver's Orange	69	22.0

Sixty varieties of field carrots have been grown at the Ontario Agricultural College and from this list four kinds were selected for the co-operative experiments in 1899.

Conclusions.

1. The Pearce's Improved Half Long White variety of carrots took the lead in point of yield in the co-operative experiments in 1896, 1897, 1898 and in 1899, and is very similar to the Steele Improved Short White which took the lead in 50 per cent. of the experiments in 1892, 43 per. cent. in 1893, 55 per cent. in 1894, and 63 per cent. in 1895.

2. The White fleshed varieties of carrots gave better yields of roots than the yellow fleshed varieties in 1893, 1894, 1895, 1896, 1897, 1898 and 1899.

3. Pearce's Improved Half Long White was the most popular, and the Danver's Orange was the least popular of the carrots tested over Ontario in 1899.

No. 17. Testing Three Varieties of Mangels and One Variety of Sugar Beets.

(For "Instructions" see experiment No. 16.)

Varieties.	Estimated value.	Tons per acre. 33 tests.
Evans' Improved Mammoth Saw Log	97	31.8
Carter's Champion Yellow Intermediate	100	30.4
Carter's Warden Yellow Globe	74	27.6
Danish Improved Sugar Beets	73	27.3

Besides sowing three varieties of mangels, one variety of sugar beets was also included in experiment No. 17.

Conclusions.

1. Evans' Improved Mammoth Saw Log variety of mangels has given the largest average yield per acre among the varieties used for co-operative experiments in each of the four years in which it hes been used in these tests.

2. The Danish Improved variety of sugar beets gave an average of four and a half tons per acre less than the Evans' Improved Mammoth Saw Log varieties ot mangels.

3. Although the Evans' Improved Mammoth Saw Log variety of mangels gave the largest yield of roots per acre, it is found that the Carter's Champion Yellow Intermediate variety was the most popular among the experimenters, and that the Danish Improved variety of sugar beets was the least popular.

4. The sugar beets grow considerably under ground and require much more labor in harvesting than any of the varieties of mangels.

No. 18. Testing Two Varieties of Swedish and Two Varieties of Fall Turnips.

(For "Instructions" see experiment No. 16.)

Varieties.	Estimated value.	Tons per acre. 5 tests.
Cow Horn	53	20.5
Jersey Navet	67	18.6
Hartley's Bronze Top	100	14.9
Carter's Imperial Hardy	47	13.3

For the co-operative experiments in turnips, two leading varieties of the Swedish class and two of the leading varieties of the fall turnips were selected.

Conclusions.

1. The fall turnips gave larger yields of roots per acre than the Swede turnips in the co-operative tests in 1894, 1895, 1896, 1898 and 1899, and one of the varieties occupied the highest place in 1897.

2. The Cow Horn variety of turnips was used in the co-operative experiments in 1899 for the first time, and gave nearly two tons per acre more than the Jersey Navet variety.

3. The Hartley's Bronze Top Swede turnip was selected as the most valuable turnip tested by the various experimenters in each of the years 1897, 1898 and 1899.

No. 19. Sowing Peas at Different Dates to Determine the Relative Amount of Injury Done by the Pea Weevil.

1. Prepare for sowing all the packages upon four uniform plots, each plot being exactly one rod square (sixteen and one-half feet).

2. Drive wooden stakes at the four corners of each plot and leave a clean path three feet wide between each two plots.

3. As soon as the land becomes sufficiently warm, run a line around the first plot and sow one of the packages of peas inside of the line ; two weeks later sow the second package on the second plot ; and two weeks later sow the third package on the third plot ; and still two weeks later sow the last package on the last plot. Aim to have the land in the same state of cultivation for each sowing, and have the peas well covered every time.

4. After the plants are up two or three inches again run the line around each plot and cut off every plant outside of the line.

5. The crops should be cut as soon as they ripen, and when dry, weighed and threshed by flail immediately on being brought in from the heat of the sun and then the grain should be weighed by itself.

6. Carefully examine the peas for the pea bugs (weevils) by splitting open 200 peas from each plot and counting the number of bugs which may be in the form of either little white worms or little darkish brown beetles.

Average date of seeding.	Per cent weevilly.	Bushels peas per acre.
		Three tests.
April 30	83	17.9
May 13	76	13 7
May 25	67	11.9
June 6	46	6.2

The pea weevil, commonly known as the pea bug, is very troublesome in some parts of Ontario. In fact, many farmers have quit growing peas owing to the severe ravages of the weevil. It is the practice of some to sow their peas quite late in the season, in the hope of securing the crop without the serious trouble of from one-half to three-quarters of the peas being infested. In our experience at the Agricultural College we have found that by late sowing we have harvested peas which were as a rule somewhat freer from the weevils than those produced from an earlier seeding, but, at the same time, the yield of crop was also much less. In 1899 we sent good sound peas to those over Ontario who wished to join us in obtaining more definite information regarding the influence of the weevil by sowing at four different dates in the spring, and as a result we have received the reports of three successfully conducted experiments.

Conclusions.

1. In each of the experiments the percentage of weevilly peas decreased as the date of seeding advanced.
2. With two slight exceptions, the yield of peas from each plot decreased as the date of seeding became later.
3. The yield from peas sown on the 6th of June was only about one-third as great as from peas sown on the 30th of April.

No. 20. Planting Potatoes Immediately after and Five Days after Cutting.

1. Prepare for planting all the potatoes received on uniform plots of equal size.
2. Each plot may consist of (*a*) six rows, each 16 feet 6 inches long; or (*b*) three rows, each 33 feet long, or (*c*) one row 99 feet long.
3. The rows should be thirty-three inches apart in every instance.
4. Count the potatoes in one of the packages and then cut them into sixty-six pieces. Five days later, count the potatoes in the other package and also cut them into sixty-six pieces.
5. Plant both packages of potatoes on the two plots immediately after the second lot is cut. Start to plant nine inches from the end of each row and drop the pieces eighteen inches apart. There will thus be room for exactly sixty-six pieces in each plot.
6. Watch when the plants first appear and also the comparative vigor of growth of the crops on the two plots.
7. Count the number of hills of potatoes which grew on each plot.

Time of planting.	Bushels per acre.		
	4 Days Period. 17 tests.	5 Days Period. 192 tests.	6 Days Period. 9 tests.
Immediately when cut	224	178	180
4, 5, or 6 days after being cut	197	166	165

The following table gives the average results of planting seed potatoes immediately after and from four to six days after being cut, for three years over the Province, and also for three years at the Ontario Agricultural College :—

Time of planting.	Bushels per acre.		
	Farms over Ontario.		O. A. C. 3 years.
	1899, 218 tests.	3 years, 240 tests.	
Immediately when cut	182	184	195
From 4 to 6 days after being cut	168	165	176

Some people cut their seed potatoes in the evening and on rainy days and plant them several days later, while others cut their seed potatoes and plant them immediately. Experiments have been conducted at the College in three different years in order to ascertain the comparative results from the two systems. In every case, the freshly cut potatoes gave better results than those which were cut four or five days before planting. In the experimental work conducted by the Union in 1888 and in 1889, a similar test was carried on as a part of a larger experiment. In 1899, it was placed on the list as a separate experiment, and it was selected by a great many experimenters throughout the Province, and the results are both interesting and suggestive.

Conclusions.

1. Seed potatoes which were planted immediately after they were cut produced a a larger average crop by at least twelve bushels per acre than seed potatoes which were cut and allowed to remain four, five or six days before they were planted in the average of the experiments conducted on two hundred and eighteen Ontario farms in 1899.

2. In the Union experiments for each of three years, and also in the College experiments for each of three years, the seed potatoes which were cut and planted immediately afterwards gave decidedly better results than those which were cut from four to six days before they were planted.

3. In 1899, fully two thirds of the experimenters favor planting the seed potatoes immediately after they were cut.

No. 21. Growing Corn in Drills and in Squares.

1. Measure off two uniform plots, each exactly four rods square (66 feet to each side). Leave 16 feet between the plots for a horse to turn when cultivating the corn.

2. Plant both plots on the same day and as follows:

No. 1 Plot—(*a*) Plant the corn in twenty-two drills, each four rods long. (*b*) Allow three feet between the rows. (*c*) Drop the kernels 9 inches apart in the rows.

No. 2 Plot—(*a*) Plant the corn in twenty-two rows of hills, each four rods long. (*b*) Allow three feet between the hills each way. (*c*) Drop four kernels in each hill.

3. Cultivate No. 1 Plot in one direction and No. 2 Plot in two directions but put exactly the same amount of work on the soil of each plot. Use flat cultivation throughout.

4. Cut all the corn in one day and before it becomes badly frozen. Weigh the whole crop from each plot as soon as cut and then husk, weigh and carefully examine the ears.

Planting.	Estimated value.	Tons per acre.	
		Ears. 9 tests	Whole crop. 10 tests
Squares	100	2.7	11.5
Drills	7	2.2	10.3

There is a great difference of opinion among corn growers as to which is the best way to plant—some advocating the squares or hills and others the rows or drills. An experiment was arranged last spring in connection with the Union work by which one plot containing sixteen square rods was to be planted with the corn in squares and another plot of equal size was to be planted with the corn in drills; the same amount of seed being used in the two plots. Ten reports of successfully conducted experiments were received.

Conclusions.

1. The corn which was planted in squares produced a larger average yield of whole crop and of ears than the corn which was planted in drills.

2. The corn which was planted in squares gave a larger yield than the corn which was planted in drills by one and one-fifth tons per acre, nearly one-half of which was in the form of ears.

3. The experimenters decided in the proportion of fourteen to one in favor of planting in squares as against planting in drills.

No. 22.—Testing Six Leading Varieties of Potatoes.

1. Prepare for planting all the potatoes received upon uniform plots of equal size.
2. One row 66 feet long is required for each variety. If the rows are placed side by side, a distance of 30 inches should be allowed between the rows.
3. First count the potatoes, and then cut them in such a way that there will be exactly 66 pieces of each variety.
4. Plant the pieces 1 foot apart in the row.
5. Count the number of hills of potatoes before digging the crop.

Varieties.	Days from seeding to maturity. 12 tests.	Table quality. 16 tests.	Percentage of crop marketable. 18 tests.	Yield per acre (bushels). 19 tests.
Empire State	119	100	86	204
American Wonder	123	83	84	188
Tonhocks	96	87	72	172
Burpee's Extra Early	99	96	74	169
Troy Seedling	127	60	80	168
Stray Beauty	92	57	71	158

Two hundred and forty-one varieties of potatoes have been grown in the experimental grounds at the Agricultural College. From this list a selection was made of those leading varieties representing those which were late, medium, and early in reaching maturity. Five pounds of each of these varieties were sent out in the spring of the present year to ex-students of the College who had paid their annual fee to the Union and who wished to conduct the experiment with potatoes.

Conclusions.

1. The Empire State variety occupied first place in yield of potatoes per acre in the co-operative experiments over Ontario in 1894, 1895, 1896, and 1899; second place in 1898; and third place in 1897. It is also one of the heaviest yielders among all the varieties which have been grown in the Experimental Department at the College.
2. The experimenters selected the Empire State as being the best variety for general crop and the Burpee's Extra Early as the best variety for early use.
3. Of the six varieties of potatoes used for the co-operative experiments for 1899, the American Wonder proved to be the latest and the Stray Beauty the earliest—there being a difference of twenty-seven days between the time required for these two varieties to reach maturity.
4. In table quality the Empire State and the Burpee's Extra Early proved to be the best and the Stray Beauty and the Troy Seedling decidedly the poorest.
5. The Empire State had the largest and the Stray Beauty the smallest percentage of marketable potatoes in the crop produced on the farms on which these tests were made in 1899.

No. 23. Testing Three Leading Varieties of Winter Wheat.

Instructions.

1. Select a portion of uniform soil and mark off three plots each sixteen and one-half (16½) feet square. Allow a path three feet wide between each two consecutive plots. Should an extra variety be sown, the extra plot should be made similar to each of the other three plots.
2. Drive stakes at the four corners of each plot.
3. Sow the respective varieties upon the different plots. It is an advantage to run a strong cord around each plot and sow inside the line.
4. After the grain is up three or four inches, again run the cord around each plot and cut off any plants that are outside of the line.
5. In harvesting the plots, watch carefully the requirements of the blank form on this page.
6. The crops should be cut as soon as they ripen, and when dry, weighed and threshed by flail immediately on being brought in from the heat of the sun.

Varieties.	Yield per acre.	
	Straw tons.	Grain bushels. 72 tests.
Dawson's Golden Chaff	1.3	22.5
Stewart's Champion	1.1	22.4
Early Red Clawson	1.3	22.1
Early Genesee Giant	1.2	21.3
Imperial Amber	1.3	20.4
Bearded Winter Fife	1.1	19.4
Golden Drop	1.0	16.2

Three of the foregoing varieties have been used in the co-operative tests of Ontario for each of the past six years. The next table gives the average results of the six years' experiments with each of these varieties at the Agricultural College and also throughout Ontario.

Varieties.	Yield per acre.	
	O. O. C. tests (average 6 years)	Ontario tests (average 6 years)
Dawson's Golden Chaff	47.5	30.4
Early Genesee Giant	43.5	27.6
Early Red Clawson	43.5	27.6

The results of the winter wheat experiments were sent to three hundred and sixty of the newspapers of Ontario in the autumn of 1898 between the time of harvesting and seeding. The seven varieties of winter wheat, which were sent out in the autumn of 1898 were divided into three sets—the Dawson's Golden Chaff being used in each set. By having one variety included in each set, a basis of comparison was formed by which all the varieties could be compared with one another. The grain was sown at the rate of one and one-third bushels per acre.

CONCLUSIONS.

1. In the average yield of winter wheat per acre, the Dawson's Golden Chaff stood highest among 11 varieties tested over Ontario in the year 1893, among 9 varieties in each of the years 1894, 1895, and 1896, and among 7 varieties in each of the years 1897, 1898, and 1899.

2. In the co-operative experiments for 1899, the Stewart's Champion, Bearded Winter Fife, and Dawson's Golden Chaff came through the winter the best, and the Golden Drop the poorest.

3. The Early Red Clawson and Imperial Amber were the first and the Bearded Winter Fife and Stewart's Champion were the last to mature in 1899.

4. Dawson's Golden Chaff and the Early Genesee Giant possessed the strongest straw and the Bearded Winter Fife the weakest straw in the tests of the present year.

5. Stewart's Champion and the Bearded Winter Fife produced the longest and the Golden Drop the shortest straw in 1899.

6. In the co-operative experiments of each of the past six years, the Dawson's Golden Chaff was one of the least and the Early Genesee Giant was one of the most affected by rust.

7. In 1899 all varieties were practically free from smut as the seed used was so free from the smut spores.

8. Stewart's Champion and Dawson's Golden Chaff produced the plumpest and Imperial Amber and Early Red Clawson the most shrunken grain in this year's tests.

9. Stewart's Champion and Dawson's Golden Chaff were the most popular varieties and the Golden Drop was the least popular variety with the experimenters in 1899.

10. During the past seven years, the Dawson's Golden Chaff has been an exceedingly popular variety with the farmers who have been conducting these co-operative experiments throughout Ontario.

CO-OPERATIVE FRUIT TESTING.

H. L. HUTT, B.S.A., DIRECTOR OF CO-OPERATIVE EXPERIMENTS IN HORTICULTURE, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

The co-operative testing of small fruits was begun in 1894 with sixty experimenters. Each year since then the work has been steadily increasing, and this year plants were sent to 225 experimenters.

The following table gives an idea of the scope and progress of the work during the past six years :

	1894	1895	1896	1897	1898	1898	Total.
Number of Experimenters	60	100	120	150	225	225	880
Plants distributed :—							
Strawberries	720	960	960	2,400	4,800	4,800	14,640
Raspberries	360	480	480	480	600	600	3,000
Black Raspberries	360	480	480	480	600	600	3,000
Blackberries	....	....	480	480	600	600	2,160
Currants	180	240	240	240	300	300	1,500
Gooseberries	... .	240	240	240	300	300	1,320
Totals	1,620	2,400	2,880	4,320	7,200	7,200	25,620

The interest in this work is increasing year by year, and although we are now sending out nearly five times as many plants as were sent out when the work was begun, yet the demand for plants has always been far in excess of what we could supply. In fact we have sometimes wished when the applications for plants were coming in so fast that those who receive them would be just as eager to report upon them afterwards. The value of this work, however, cannot be judged altogether by a summary of the reports sent in by experimenters. The greatest value naturally accrues to the experimenters. We send out 4 varieties of each kind of fruit under test which from our own and other experiments we think are most likely to give the best results throughout the country. Each experimenter then finds out for himself which of these is best adapted to his particular soil and locality. From the plants sent, he may, with proper management, propagate enough new plants to set out a plantation sufficiently large to supply the needs of an ordinary family. In this way many are getting a start in growing small fruits for their own use, who would otherwise probably never have given a thought to it. From the reports sent in we are pleased to learn that many are availing themselves of the opportunity. One experimenter mentions in his report that from the black raspberry plants sent to him he now has plants enough of the variety which did best with him to set out about two acres.

The following is a list of the plants distributed for co-operative testing last spring :—

100 lots of strawberries — Clyde, Haverland, Van Deman and Woolverton — twelve plants of each.

25 lots of raspberries—Cuthbert, Golden Queen, Marlborough and Shaffer—six plants of each.

25 lots of black raspberries—Gregg, Hilborn, Palmer and Souhegan—six plants of each.

25 lots of blackberries — Gainor, Kittatinny, Snyder and Taylor — six plants of each.

25 lots of currants — Fay's Prolific, Raby Castle, Victoria and White Grape — three plants of each.

25 lots of gooseberries — Downing, Pearl, Industry and Whitesmith — three plants of each.

No report of yields could be expected from these before another year, but the majority of experimenters report that the plants were received in good condition, and notwithstanding the protracted drouth of last summer, many report that the plants have done well. About 50 per cent. of those reporting state that they have a full stand of plants.

Owing to the intense cold of last winter, when the ground was bare of snow, many of the plants, such as raspberries and blackberries, previously planted, were severely winter-killed. And for this reason not only the yields but the number reporting the yields this year are far below the average. In the following tables is given a summary of the yields from the different fruits sent out during the past four or five years :—

STRAWBERRIES.—The following table gives the yield in ounces per dozen plants :

Varieties.	Date of planting.	
	1898. 15 expts.	1897. 3 expts.
1. Clyde	179.4	....
2. Woolverton	124.9	40.7
3. Haverland	124.6	29.0
4. Van Deman	84.5	7.8
5. Bubach	....	17.9

Clyde, which comes at the head of the list, is a new variety and is, probably, one of the most valuable varieties yet introduced. Our first plants of it, obtained three years ago, cost us $2.00 per dozen. It is a thrifty, vigorous plant-maker, produces uniformly large, well shaped berries, which, although rather light in color, are firm and of good quality. In productiveness, Clyde has ranked near the head of the list in our College experiments for the past two years we have fruited it among about 220 varieties we have had under test. It was distributed last year to 100 experimenters in place of Bubach, which, although a large fine berry, does not make plants enough to give a very heavy yield. Haverland and Woolverton are two choice varieties, and they come out practically about the same in these tests. Woolverton, however, does a little better than Haverland the second season of fruiting, as may be seen by referring to the yields given for plants set out in 1897. By comparing the results for the two years we have valuable proof of the fact that the first crop from a strawberry plantation is by far the best, and it is very seldom that it pays to leave the plantation for a second crop. Van Deman, the variety standing fourth on the list, has made rather a poor showing as far as yield is concerned, but for earliness and handsome fruit it has always ranked high in our experiments at the College.

RASPBERRIES.—In the following table the yields are given in ounces per bush.

Varieties.	Date of planting.		
	1898. 3 expts.	1897. 5 expts.	1896. 1 expt.
1. Shaffer	10.8	51.4	24.
2. Cuthbert	14.6	37.0	42.
3. Golden Queen	10.1	28.6	8.
4. Marlboro	6.4	34.6	38.

This is one of the experiments upon which the severity of the past winter was very marked. Many of those reporting say that the plants were frozen down to the ground. Consequently there were comparatively few who sent in a well kept record of the yields, and those reported are below the average. Shaffer heads the list for those plants sent out in 1897, while Cuthbert comes first for those planted in 1896 and 1898. From the reports sent in, Shaffer appears to have stood the winter in most places quite as well as the other varieties which are usually considered more hardy. While too much value must not be attached to comparison of yields here recorded, because of the severity of

the past winter, and the limited number of yields reported, yet we can say from our own experiments at the College, where we have had four times the number of varieties under test, that each of the varieties in this experiment is among the best of its kind and should be in every home collection. Marlboro is one of the best of the early varieties, Golden Queen ranks first among those giving a late yield and is the most satisfactory of the yellow varieties, Cuthbert still ranks as the "Queen of the Market," and Shaffer is one of the heaviest yielders, and the one most prized in the home garden.

Black Raspberries.—In the table below the yields are recorded in ounces per bush.

Varieties.	Date of planting.				
	1898. 10 expts.	1897. 4 expts.	1896. 1 expt.	1895. 2 expts.	1894. 1 expt.
1. Hilborn	128.2	37.8	10.0	....	....
2. Palmer	122.5	53.9	12.8	41.5	21.0
3. Gregg	67.4	27.7	15.3	37.8	21.0
4. Souhegan	46.9	48.1	7.5	40.0	21.5
5. Tyler	....	....	....	34.0	20.0

From our black raspberry experimenters we get a great variety of results and opinions, so much so that each variety under test has in one place or another come out at the head of the list. On the whole, however, Hilborn and Palmer have made the best showing.

Blackberries.—The yields given in the following table are in ounces per bush.

Varieties.	Date of Planting.	
	1898. 2 expts.	1897. 2 expts.
1. Kittatiny	0.3	16.6
2. Snyder	1.5	10.3
3. Gainor	1.0	9.6
4. Taylor	1.6	5.1

This is another of the experiments with which the severity of last winter played havoc. The majority of those reporting upon it state that the most of the plants were killed down to the ground, and in some cases were killed outright. From the small number of yields here recorded it would not be safe to draw any conclusions as to the relative productiveness of the varieties under test. Kittatinny is one of the most popular varieties in sections where the blackberry is largely grown, and it headed the list in 1898 among those varieties under test at the College. This year Agawam holds first place, it being one of the few which came through the winter uninjured.

Currants.—The yields recorded below are in ounces per bush.

Varieties.	Date of Planting.			
	1898. 4 expts.	1897. 7 expts.	1896. 6 expts.	1895. 3 expts.
1. Raby Castle	2.9	39.9	19.4	38.5
2. Victoria	2.3	34.9	23.5	51.6
3. Fay	2.1	27.6	16.5	9.1
4. White Grape	1.7	17.3	37.4	11.5

The results given in the foregoing tables are the averages of twenty complete experiments with plants set out during the past four years. For those set out in 1897 and 1898 Raby Castle holds first place. This is a very heavy yielding variety, but it is a smaller currant than any other on the list. Fay is one of the largest and finest currants, but in these experiments it has not yielded so well as the others, although in our College experiments this year it holds first place over all other varieties under test. Victoria is a good sized productive variety, well worthy of a place in any collection. White grape is one of the finest of currants, and previous to this year it has always proved to be one of the heaviest yielders. For a home variety it has no equal, but in the market the red and black varieties are more in demand.

GOOSEBERRIES.—The yields recorded below are in ounces, per bush., being the average of 28 complete experiments, with plants sent out during the past four years.

Varieties.	Date of planting.			
	1898. Eleven experiments.	1897. Five experiments.	1896. Five experiments.	1895. Seven experiments.
1. Houghton	19.4	45.2	32.0	51.1
2. Downing	14.5	39.2	27.0	50.4
3. Industry	7 8	21.1	12.0	27.0
4. Whitesmith	4.6	24.5	7.0	26.0

The two varieties at the head of the list are of American origin, while the other two are English varieties. Between the two classes there is a very marked difference. Our American varieties, as is clearly shown by the results given above, are by far the heavier yielders, although the English varieties produce much larger and finer berries. The susceptibility of the latter to mildew is the great obstacle to their success in this country. Of the two American varieties Downing is the larger and finer berry, and in our College experiments it has, for the past two years, ranked ahead of the Houghton for productiveness.

TREASURER'S REPORT, 1899.

RECEIPTS.

	$ c.
Balance from 1898	292 91
Membership fees	103 50
Government grant	1,200 00
Sale of weed seeds	5 00
	$1,601 41

EXPENDITURE.

	$ c.
Agricultural experiments	799 89
Horticultural "	170 65
Soil physics "	27 90
Botanical "	14 55
Annual meeting, 1898	143 23
Advertising meeting, 1899	76 50
Expenses of executive	28 18
Salary of editor and Secretary	105 00
Balance on hand	235 21
	$1,601 41

We, the undersigned Auditors of the Ontario Agricultural and Experimental Union, beg leave to say that we have examined the accounts of the Treasurer, and find them to be correct.

G. H. HUTTON.
G. A. PUTNAM.
Auditors.

Ontario Agricultural College, Dec. 7th, 1899.

INTENSIVE FARMING.

By George T. Powell, Ghent, N. Y.

There is perhaps no one problem that has caused more thought and discussion than the migration of the population from the soil. This subject has engaged the first thought of the ablest men of all countries. We have seen the marked tendency of population to leave the country and to concentrate in cities. This has been true in all portions of Europe ; it has been particularly true in the United States ; and you are not without exception here in Canada. There has been very much discussion going on as to the cause which would send a population drifting from the soil to the cities, cities naturally of trade and commerce carried on extensively. Railroads to-day are seeking cities as their terminus, and they necessarily are instrumental in carrying large numbers to city centres. Manufacturing has also of late years been concentrating in cities, and so we see another cause calling laboring classes in large numbers to city centres. Perhaps the depletion of the soil may carry its own responsibility also for the movement or migration of population from it. We recognize that there have been great changes in methods in farming. There is a tendency to overlook the intensive system while the extensive system is carried out. That of itself is a prominent cause for driving the population away from the soil, because in the extensive principle machinery is used to a large extent, and where machinery is largely introduced human labour is naturally discontinued, and less labour is called for on the farm by the introduction of machinery upon the extensive system of farming. We find to-day that all lines of industrial work are overcrowded ; there are more people to-day concentrated in cities than there is occupation for. Manufacturing industry has been stimulated to a great extent, and the question now arises, what is to be the solution of the question of over-populated cities and depopulated country districts ? I have thought upon this question and studied it, and it seems to me that agriculture to-day offers a new field for development along some new lines, and the especial lines which I shall discuss this afternoon is that of a more intensive system of agriculture. There is the danger in concentration of large numbers in cities, where they cannot be profitably employed, of their becoming largely non-consuming. That is, the growth of cities should naturally be a great benefit to the producing class. If there is a large population in cities it is impossible for all to procure profitable employment, and they fall into a large dependent class, and the larger the dependent class becomes in a city the less profitable do they become to the producers of the soil. Now arises the question of a more intensive system by which larger numbers of people may be profitably employed in the culture of the soil. I believe it is through this channel that we have yet to see a new development in the pursuit of agriculture—the intensive system, which means the cultivation of smaller holdings. We all understand, who are dealing with these practical problems of the production of the soil, that two things which have happened recently, somewhat of a decline in yield accompanied by lowering development, cause a great deal of discouragement and depression among the agricultural class. Moderate yield, or no yield accompanied by low prices brings the farmer into a condition which it is difficult for him to know how to meet, and we have been passing through this period now for a number of years. . . . I think the great fault is that we are attempting to spread over too many acres. The lesson of the future should be concentration of acres ; it should be aiming at maximum yields as one of the first principles in solving the question of the reduction of cost. Take, for instance, wheat culture. The farmer who is producing twenty bushels of wheat per acre is running very close to the line of having his profits entirely consumed by cost ; when he can have ten more bushels of yield per acre he is rising beyond that line ; if he can secure a yield of wheat that will reach 30 or 40 bushels to the acre it does not matter so much what the price will be, he is above the cost line considerably, and he can stand the period of low prices because he has brought his land to a condition where he is producing maximum yields ; he gets beyond the cost line, and although the value may be low per bushel yet withal he receives a margin of profit through his maximum yield. This will apply to all farm crops; from potatoes and all kinds of roots to any of the cereals which we produce. The average for the United States in potatoes does not exceed in the present year sixty bushels per acre. While that

s true there are instances where the yield has run to 400 or 500 bushels in individual localities. The class of producers who fall within this average are the class who are suffering to-day from severe agricultural depression; those who get beyond the average and reach the maximum yields, even though low prices exist, are those who are to-day solving the problem of successful agriculture. So it is along the line of intensive culture that we are to solve the problem of a country leaving the pursuits of agriculture, and of drawing away a large non-consuming population from many of our large cities. I shall be pleased this afternoon to deal along the lines of horticultural work, because that is the special work carried on in many instances. I have been interested while among you for a few days by the discussion carried on by the Ontario Fruit Growers' Association. Studying along the line of intensive culture we need to study with it the products which will have the highest value; and to-day there is nothing which promises a better value than along the horticultural line of work. Apple culture is destined in the near future to be one of the most profitable as well as interesting lines of study. The apple seems to be a fruit which is staple in character, and one greatly in demand in all our home and foreign markets. During the year 1896, when there was a phenomenal apple crop both in Canada and the United States, apples were introduced in markets where they had never before been introduced, with the result that by a single introduction in some of the German markets the Canadian and American specimens were thought to be so fine that in a very short period of time a strong demand has grown up in those same German markets. The English market is also calling for a vast quantity of apples grown upon this soil, because the English people recognize the exceedingly fine quality which is put into that superior fruit by the climatic conditions on this side of the Atlantic. Apple culture offers to young men one of the finest fields for development. The question now arises to the young man, or old one, if he proposes to take five acres, or ten acres, or fifteen acres of land and plant them in an apple orchard, of bringing that orchard into productiveness in the shortest possible period of time. We cannot to-day, in this age of rapid development—we cannot in this day of exceedingly sharp and keen competition which is springing up in all parts of the earth—we cannot afford to plant orchards and then wait ten or fiften years to bring them to bear for us. That has been too much the case. We have simply planted trees and rested with that as our duty, and we have had supreme failures. He will be wisest who studies those laws and forces, and works in the greatest harmony with them; and so in planting an apple tree or an orchard we must study the law of development, and we can bring to that a very great aid indeed in shortening the period in which the apple orchard can be brought to bearing. By way of illustration, we want to study the question of the inherent principle of early bearing trees; we want to study the question of individuality in trees. If we plant a hundred trees we want to recognize the fact that each of those hundred trees differs in some respect, that no two are going to develop the same, but there are distinct differences existing in the hundred trees we put out. The lesson of to-day is for the cultivator of the orchard to study those individual differences, and to discover if he can the most valuable qualities, and then work from the standpoint of selection and propagate from those which give him the best representatives of their kind. Now for a practical illustration of what this will do. I think the average length of time in which orchards are brought to bearing will exceed twelve years. You may look over your country and go back over the history of apple culture in those districts where apple growing is carried on extensively, and I think you will agree with me that before an orchard comes into bearing a period of twelve years is usually covered. In some instances fifteen, in other instances twenty years will have passed before much fruit is obtained from the orchards. Starting out on the individual and more extensive method of development of orchards a few years since, we selected as a basis a variety known to be exceedingly vigorous and strong in its constitutional growth. I mention now the Northern Spy. The Northern Spy tree is one which has an exceedingly fine close wood, and in consequence of the character of its wood presents a strong resisting power against disease and also against certain types of insects. Now, this is an important fact, to understand these differences in the constitutionality of trees. Hence the Northern Spy was chosen as a foundation on which to work. Now, by way of illustration. It was desired to grow in many instances the King apple, which truly is a king of apples. The Tompkins Co. King pr-

sents in our own market and in the English market the height of excellence. It is a fruit that possesses exceedingly fine flavor and high quality; it is beautiful in color, and at the same time desirable in form and size; and yet in some cases the Tompkins Co. King grown upon its own stock is defective; it is constitutionally weak. Its period of life will not extend in many instances beyond fifty years, and hence you get but a very few years of fruit bearing from the tree because of this constitutional defect in point of vitality. Under those circumstances you could not be advised to plant King orchards; in other circumstances you may be advised. That is, choosing as the foundation this strong, vigorous, healthy stock presented in the Spy, and equally so in your vicinity in the Tallman Sweet, which is another tree of like characteristic in regard to its vigor and hardiness and constitutional strength. Now then, having chosen this foundation to work upon, comes the question of transferring the King variety upon the hardy stock of Northern Spy or Tallman Sweet. What were the exact processes? That is what we want to know. I have been delighted to see the methods pursued in this direction by those of you who are interested in the development of horticulture in Canada. I am glad to be able to give you an account of a few years' experience along this line which may be helpful to you. The processes were these: In transferring this constitutionally weak variety of apples on to a large orchard, in order to have a successfully producing orchard, the individual characteristics of trees were studied before the buds were taken from them. And so the points are simply these. In the selection of buds or scions to be transferred the general characteristics and form of the tree itself were taken into account. Before the scion was cut the tree was studied to know whether it was naturally a fine tree in its form and in its growth, eliminating thereby the necessity for continuous and excessive pruning, a very important matter to study along the line of intensive culture.

Mr. Mills: Do you mean the tree on which you were to graft the other?

Mr. Powell: The tree from which the scions were taken. We are going to transfer a new tpye to a new orchard. We are going to eliminate on the intensive method of culture much of the process of growing. So the fruit grower must first be a horticultural architect, and he must study the form of tree just as closely and as minutely and carefully as he would study the form of a building. That is the principle. Secondly, the form and character of the fruit. Most of you, and especially your experimenters, have discovered that on almost all trees there is a difference between the form of the fruit. All trees do not produce uniformly. Some trees will produce a certain amount of fine fruit, others will produce a large amount of uniform fruit. Now, we want to select carefully from trees which we find on close study of their fruits give the best uniformity. Then take the scion or bud from that tree and transmit that property or principle to the new orchard. That is the second vital point under consideration. Third, study the tendency and character of trees and plants with reference to their tendency to come into bearing early. Some trees will produce wood for years; others again will show a tendency and a development in the direction of producing fruit in a comparatively short period of time. Make that distinction clear in the mind, that in transferring the one to the other the tendency of early bearing shall be transferred, and the period, I have proven, can be shortened fully one half in bringing a new orchard into profitable value. I want to give an illustration of the subject. Having been working on this principle now for about seven years I am very glad to be able to give you now the positive results which have come from it. Believing in this, and working along this line for a few years, there is satisfaction in being able to give you positive results. I hold in my hand here, and you will take an opportunity to examine it, wood from young trees which have been treated in the way I have indicated and discussed. This is known as the Southern Beauty; as beautiful as the King, nearly as good as the King, and in many ways superior. Buds were taken from trees showing a tendency to early maturity and uniformity in the character of their fruit. This wood represents the growth upon a graft which was set three years since, and from some of this same wood averages were taken producing two bushels of apples the third year from the time the grafts were set. There seemed to be no exception; every specimen was absolutely perfect; it would all grade and number one in quality. This seems to be in response to the efforts made in this direction, to transfer that tendency from a tree which has been known for years to do that thing, and get it in three years from a young tree. This has

been broken a good deal, but you will see upon this young wood a very fine development of fruit buds. These trees have been under very intensive culture. From the time of the opening of spring until cultivation should cease the ground was very highly tilled ; and although in New York State we passed through an exceeding severe drouth, continuing for six months, with no rainfall to wet the roots of the trees scarcely once during the season, you can see the amount of growth made on these trees altogether that bore the two bu-hels of apples, and in addition the producing of very fine fruit buds, all under very unfavourable conditions. Here is where the value of intensive methods comes in : under adverse conditions the development can be carried on to a degree which will give you satisfactory results. So we have here good wood for next year, and a good development of fruit buds to produce for the next season. I want to show you also the possibility of developing the early tendency to produce fruit in a peach. I hold in my hand some peach wood taken from trees that had been growing on the soil for a year and a half when the buds were developed, and yet during the past season there has been an exceedingly fine development of fruits buds on those peach trees which have grown but one year and a half. The soil has been put into the finest possible chemical condition and kept so. The result has been that there has been a very fine growth not only of tree, but there has been a remarkable development of fruit buds. This is a principle which it seems to me is valuable for us to study as students, as farmers, all along the line of horticulture and agriculture ; that is, the most rapid development, the quickest development we can get, both in the production of trees and in the production of our cereals, and also in the finest development of our young stock. The same holds good right through our live stock interest. We shall find our greatest satisfaction and largest profits in the quickest development of our young live stock upon the farm. The same principle runs right through the trees just the same as it does through the steer, or lamb, or any of the animals on the farm. It is an important lesson for us to study.

Mr. Hutt : Does not early maturity shorten the life of the tree?

Mr. Powell : That is a question I cannot answer, because I have not put my orchard through that system of bearing yet. Suppose it does shorten the life, we get our profits so much quicker we can afford to shorten the life of the tree. But as I study the question there is a doubt in my mind whether it will or not. It possibly may in the instance of the peach.

Q. Would this early bearing be at the expense of bearing later on ?

Mr. Powell : I think from my study of the question of nutrition, of properly feeding these trees, that we can cover as long a period in this system as we can in the other. My opinion is that it is a question of nutrition ; that if we will properly supply these trees with plant food, and keep up this growth of wood and development of fruit beds, it will be a question of nutrition.

Q : Do you keep the same flavor of the Kings on the grafted trees ?

Mr. Powell : I am glad that point came out. While the quality or flavor is, perhaps, not changed, there is no question or doubt in my mind that the period of maturity of fruit is somewhat changed. Now for illustration of that point. The first work done on this principle was done by my father many years ago He grafted the Cayuga Redstreak upon the Early Harvest apple, which we know in New York State to be an exceedingly early apple, coming to bearing with us in the month of August. The result has been by top working the Cayuga Redstreak upon this Early Harvest apple I have been able to ship these apples to Liverpool in the month of August, only a few days later than the Early Harvest apple ripens itself. In the month of August I think I have been almost the only American shipper who has sent that variety to Europe. Now with regard to the top-working of pears on the Keiffer stock. The Keiffer is a late maturing variety, one of the latest possibly, with the exception of winter pears. I have been top-working the Anjou, which is a very superior pear, on the Keifler stock, with the result that the period has been prolonged for maturity of the Anjou pears. When the Anjou pears on their own stock are ready for market those on the Keiffer are not ready until ten days later. So that here seems to be another illustration of the fact that the stock certainly does have some influence on the maturity, early or later, of the scion upon it.

I want in a very few moments to give a few points on the development of strawberries. Small fruit culture is expensive, far more costly than the growing of cereals.

Small fruits are, perhaps, the most expensive of all the productions taken from the soil, and hence it is of the utmost importance that if we enter small fruit culture, and there is a wonderful field in this direction, we understand the principles of the finest and best development of those fruits in order to reach maximum results. During 1898 we started out to demonstrate what could be done in the line of higher development of the strawberry. We have never yet learned the possibilities of intensive culture in any direction; we have never yet learned the possibilities of the soil to produce, and it becomes an interesting field for observation to find out the possibilities or extent of production. Taking an acre and a half of land we put it under a high system of tillage. We pushed the development of the strawberry in 1898 to a very interesting point, so far as the development of the plant was concerned. When we reached the past season, 1899, we were met with conditions unparalleled having to go through the most trying ordeal just when we should have reached full results. The drouth was continuous, and not once did rain fall upon those plants from the time they started to grow until they had passed the fruit season, and so we were cut short in the fulness of the results which we would otherwise have had. But we were able to develop single plants upon the principle which Prof. Hutt has already explained to you. We were able to develop plants during this past year which measured across the diameter of their foliage two feet in any direction. Now the question is, how was it possible to bring up the development of strawberry plants which would measure two feet across in any direction? It was simply by studying the law of development in the plant itself, and an illustration can be given here. In attempting to develop upon the intensive line of culture the strawberry, we must understand the principles which control its growth, the principles which gives the best possible development in bearing plants in order to reach the high results we are aiming at. Now, this plant has two systems of growth; one is the growth of the crown of the parent plant which will be fruit-bearing. It has another system of throwing out branches or runners which if allowed to extend in this direction will take root and reproduce their kind. If we want the finest development of fruit bearing plants we must cut off the runners or lateral plants. If that principle is kept strictly in view the limit is not known to which the production can be carried. It was by this constant cutting away of the runners that we developed these strong crowns which gave this very fine development of plant. It was a pleasure to go through those grounds in the opening of the spring, when the plants were in their fullest vigor, when they had passed through their blossoming period, and be able to count the large number of berries formed on a single plant. Of course the drouth started at the same time, and a comparatively small portion could get through, but it shows the possibilities of development in this connection. On good soil your rows should be planted four feet apart, and not less than two feet distant in the rows. You see with such development of plant as that you must have room for the roots to go out, as they do so largely, and room for the development of the plant itself and for sunshine to get along the plant.

Q.: You only cultivate the one way?

Mr. Powell: Only the one way. Now, it is along these lines that it seems to me the future promises so much in agricultural development, and we have not entered the field of the best development of agriculture as yet. I was delighted while here in your midst, and especially so in all this splendid array of experimental work which has been carried on among your farmers, to know that you are reaching out along this line of higher development, and it seems to me there is no finer prospect for the young men going out from this College than work along this line of intensive farming.

Dr. James Mills: I cannot allow the opportunity to pass without expressing the pleasure which this address has given me. It has opened up to my mind an entirely new field. We have looked for these characteristics in cattle, sheep, swine, poultry and so on, but I am inclined to think the majority of us in this Province have not given much attention to the study of individual trees of the same variety, and I can see from what Mr. Powell has said that in this there is a great and important field before us. I have been pleased with his address because I felt from the first that it was being given by a man who understood exactly what he was saying. He has done the work himself. Clear, logical and scholarly, it was a pleasure for me to listen to, and it is a pity to let the opportunity pass without at least a number of questions. I should like to have a word from Mr. Powell as to what he means by intensive cultivation, the cultivation, say, of

those trees until they are two years of age, on which he intends to graft the more valuable varieties. What is the nature and extent of the cultivation and the manner of treatment these trees receive?

Mr. Powell: The subject of tillage will, I think, come in under the talk to-morrow. There is one point, however, which I did not take up this afternoon for fear of encroaching too much on your time, and that is the resistance of the different trees against fungus. For instance, the Baldwin. The question has been asked several times why is it the Baldwin apple has so generally gone down? Why is it in my own State of New York, which a few years ago was everywhere so popular and productive, why is it to-day failing to produce only, perhaps, once in four, five, or six years? The facts are these. The foliage of the Baldwin apple is defective; it is not resistant to the apple scab fungus; it is going down under the disease known as apple scab fungus. That is the reason we are not growing the Baldwin apple as successfully as we did; because of the extension of the planting, and the disease extends with the planting. The wood which I have here shown you comes from a variety known as Southern Beauty, which is very similar to the Baldwin in appearance, size and color, has all the desirable qualities of the Baldwin in every respect, and is even better by fully 50 per cent. in point of fine flavor. The Southern Beauty is resistant against the apple scab fungus. So here comes in the question of the ability of foliage to resist disease, and if we can propagate a variety which has naturally strong resistant power, why there is an immense advantage in developing that variety. How many of you recognize the Spitzenberg apple? Not many. The Spitzenberg presents, perhaps, the finest quality, the choicest flavor. There are English people who recognize the fine quality of that apple and are willing to pay the price for it. The Spitzenberg is becoming extinct because the foliage of that variety is not able to resist the apple scab fungus. So that is another very important study, the resistant power of foliage, and there is as much difference in foliages as in the other classes I have mentioned here.

Mr. Macoun: I am very pleased indeed to have this opportunity of appearing before the Ontario Agricultural Union. I was here only once before, and enjoyed myself very much. I hope I shall have an opportunity of coming very frequently. I was particularly interested in Mr. Powell's address, as we have been carrying on some experiments somewhat in the same direction. I think most of you know that we have a much severer climate at Ottawa than you have in this part of the country. Our winters usually begin about the third week of November, and we have continuous sleighing until some time in March. During that time the thermometer drops quite frequently to twenty below zero, and the trees have a very trying time of it. We have found that many of the better winter varieties will not succeed at Ottawa when grown in the usual way. Such apples as the Northern Spy, Baldwin, King, Red Holland, Greening, Spitzenberg have all failed when grown in the usual way. In 1891 or 1892 Mr. John Craig, the late horticulturist, grafted some Northern Spy on the Wealthy and Duchess apples, and the result is the tops have proved perfectly hardy. We had fruit last year and again this year. We find very frequently that a tree not killed back by winter will kill outright at the root, so that the conclusions we have reached are that, if we can top-graft these trees on hardy stocks it is possible we may produce in considerable quantities such fine apples as Northern Spy and Baldwin. The King seems a little tender at the terminal wood, and I am a little doubtful with regard to it. I was particularly interested in Mr. Powell's address because there are so many orchards in this country which are practically worthless because at the time they were set out there were very few good varieties propagated. It was supposed that only grades would succeed in the northern part of the Province. I would like to add a word of caution as to top-grafting on the Wealthy and Duchess. These apples have been planted extensively in the Province. They begin to bear early and have abundant crops. The difficuly is that they have early fruits and the market is glutted with them. Our experience has been with the Northern Spy; they fruit early on these trees, but the top is getting so heavy I expect in a very few years we shall lose the whole tree. The top will become so heavy that in a big storm it will break right off at the point of union. So that the point to be taken into consideration is to have a very strong-growing stock, and I don't think it will matter so much then whether your top is strong-growing or weak-growing, but if it is the other way ill results will be sure to

follow. We had a striking example of that this year in a European plum which had been grafted on the American plum. There was such a difference in the top and stock that it caused the death of the tree; the sap did not seem to be able to get into the top, and the result was that it died.

Dr. MILLS: Have you given any attention to the question of the trees from which you select your grafts or buds?

Mr. MACOUN: When we are grafting new stock we always make a point of taking scions from trees which have borne the best crop.

Mr. W. HUTT: Can any method be suggested by which trees can be induced to bear? In Welland county we have everything apparently all right, except that they don't bear, and they seem to develop the habit of unfruitfulness.

Mr. POWELL: It is a somewhat difficult question to answer, but if your trees are inclined to a continual growth of wood there must be some check given to that tendency. There are two ways in which it can be done. You can cut the roots, and thereby check the tendency to grow wood. The other way might be to seed the orchard down. I don't like to see an orchard standing in seeding, but if it is growing too much wood it would be better to seed that orchard down rather than keep up cultivation.

Q.—Where you have an orchard of large trees what system of grafting would you pursue?

Mr. POWELL: The regular cleft system is preferable. Take your wood when about an inch in diameter and just insert on the cleft principle. You get a very complete union, and after a few years you cannot see where the cleft is set. You want to take into consideration the form of your tree. Never start trees so that the branches come opposite each other. If you do you are sure to have broken trees, because when they come to bear they will split or break down. Cut off your branches so that there is a space of six or eight inches in the tree in which you insert your graft. There needs to be great care taken in all this principle of grafting. It is only lately I have discovered that you may introduce disease merely by grafting. Suppose it fails to grow. It is of the utmost importance that that scion which fails to grow should be taken out and the wound waxed over so that it shall heal perfectly. I have discovered that the scion which does not grow becomes diseased, and the disease will follow right down to the stock.

Dr. MILLS: In speaking of the Baldwin apple and the fungus, would not spraying help that?

Mr. POWELL: Spraying would help it if done persistently, done thoroughly, and done in time. I think the experience is that half of our spraying loses its benefit by not being done in time. The development of the fungus is far in advance when sprayed. If it was in your orchard last year, it is present there to day—and it is ready to develop on the spurs on which your buds are growing. It is there all ready to spring into life with the first opening of spring. So that we need to do our spraying far in advance of what it usually has been done, and that would be before the foliage appears at all, and about the time the buds begin to swell or the first indications of life come to them in the spring. I think it can be controlled by the Bordeaux mixture if the syraying is done early in the spring.

W. J. BROWN: There is one subject in which I am very greatly interested and which has not been touched upon—that is, the question of wind-breaks for orchards. I noticed in travelling through the counties in the west during the last fall that the large percentage of orchards which had crops worth harvesting had a wind-break, and I came to the conclusion that if I expected to have crops worth harvesting on my own farm it was necessary to have a wind-break, and I would like some information on that point, the distance apart and how they should be cultivated.

Mr. POWELL: I have been working on the principle of wind-breaks for a number of years, and have followed the practice to grow lines of trees on the windward side. In my own section of the country we get slopes to the north, southeast and west. When an orchard is planted my practice is to plant a line of trees where the wind strikes heaviest, and I have planted the Norway spruce and white pine, the two principal varieties. The Norway spruce is a rapid grower. They are planted usually 15 feet apart, and then as they grow up and interlace too heavily every other tree is cut out. A wind-

break should not be made solid, for the reason that we need passages for the air to circulate, because wherever there is free circulation of air there is less danger from frost and there is less hard freezing. The trees should admit of free circulation in narrow spaces at least. The Norway spruce will grow to a height of 50 feet within a period of 16 or 17 years. That, of course, is a very rapid growing tree, and considered a very valuable tree for that purpose. It is massive and heavy, and by separating occasionally the wind can pass through and break up the heavy, bad, condition of the air which is always dangerous in the spring when your trees are in bloom. Great losses have followed solid wind-breaks. I believe in wind-breaks. Their value is to protect your trees from the heavy force of the wind, and also protect your fruit from blowing off. The white pine and Norway spruce are the most valuable trees I know of. I have also planted the maple and the American elm for ornamental purposes and also to form a wind break.

Mr. MACOUN : I would like to ask Mr. Powell's opinion of the low trunk for apples. After some years I have found that our healthiest trees are those having a low trunk two or three feet above the ground.

Mr. POWELL : That is a very important thing when you are troubled with snow squalls. I believe in thorough tillage and starting your trees a little higher, because we do not have quite as much trouble from snow squalls as you have here. In the Southern States they have the head low for the same reason, although the climate is milder. So for your purpose I should say low-headed trees by all means.

H. L. BECKETT : With regard to top grafting. Some have trees of 25 or 30 years' growth. What is the largest sized limit you would consider advisable for top-grafting? Also, it is a practice with some to leave both sides, where both sides grow, to come into bearing. How many years do you think it advisable to leave them before cutting out?

Mr. POWELL : I should say on old trees you could set scions on branches at least three inches in diameter; that is a pretty large limb. I would cut across and put in four scions. Wax very heavily in this case, and let all grow for at least three or four years. When your four scions begin to close up with branches, if the growth has nicely covered it all over, then I would cut out according as it would balance that tree best. The next year I would cut another scion out. That would be healing over, and then if your other two are still growing cut a third the next season. In that way you can cut a large limb and heal it over by the growth of your four scions, and you will get a very good tree in that way. Begin at the top of the tree. If you have a tree 15 or 20 years standing, begin at the top, and only come down about one quarter the first year. Cut your top branches right out. Take out the side branches and set your scions. Then the next year go still lower down. Cut off your heavier branches, which would be three or four inches in diameter, and insert your scions. In that way you would change a good portion of the whole of the top of your tree. When you come to the lower portion you will have to leave them as they are. With regard to the second part of your question, I would let the scions grow in young trees until they come together.

Dr. MILLS : Do you approve of white-washing trees?

Mr. POWELL : Not for the purpose for which it is done. White-washing has been considered a means of improving the bark of the tree. My practice now is to spray trees with lime in order to destroy certain kinds of insects. I think the value in the use of the lime is in keeping down certain kinds of scales. I would not go over it with a brush, but would apply the spray. So far as the lime is concerned it is of no special benefit to to the tree itself. I would prefer not to have lime upon it, but I think it is useful in destroying certain insects.

Dr. MILLS : When do you apply it?

Mr. POWELL : I am just working now upon the pear trees. I have a suggestion since coming here from one of the members of your Ontario Fruit Growers' Association which may be of great importance to me, of controlling the pear sylla by a lime spray. I stand at present a loss of 700 to 800 pear trees out of 1,000 by a very minute insect called pear sylla. I have a hope in hearing the experience of one man who sprayed his trees with lime, and he thinks in that way has controlled the insect. So I shall lime my trees in February. For scale insects along about April would be the time to spray to destroy the scale.

Q. : In treating pear sylla what do you use?

Mr. Powell : The eggs are deposited along the branches and at the base of the leaf buds and fruit buds, and as soon as the sylla is hatched it settles along the axils of the leaves and fruit, and over the foliage, then runs down the branches, and so virtually destroys the tree. The trouble is to get at that minute little thing and destroy it. It is so embodied in the honey dew that it protects itself. The moment you can touch the insect with the least particle of kerosene emulsion or coal oil you kill it, but the trouble is to reach it.

Q.: In 1896 we treated with kerosene emulsion, and we have not been troubled further. We treated in May and June.

Mr. Macoun : Yesterday afternoon at the Fruit Growers' Association at Whitby I had the pleasure of presenting a paper on some results of spraying with white-wash at the Experimental Farm last winter. Probably most of the students have read Bulletin No. 38, by Prof. J. C. Whitten, of Missouri Agricultural College, in which he tells his experience in trying to keep the peach buds dormant during the late winter months and early spring. He found by covering the trees with white-wash he was able to keep the buds dormant during days when the temperature was comparatively high. His theory was that a white surface would not absorb the sun's rays as much as any other color. Of course that is a point every one knows quite well, and he wished to see if it would apply to the peach, preventing the swelling of the buds. He bored out some branches of the tree, and inserted thermometers. He found that there was a difference of from 10 to 20 degrees in temperature where there was a white surface. That is, the temperature was 20 degrees lower than where the natural timber was exposed. In trying to prove these experiments of Prof. Whitten's at the Experimental Farm last winter I ran across, I think, a very successful remedy for the oyster shell bark-louse. When the white-wash came off the trees this summer I was very much surprised to find them perfectly clean. We might find 5 or 10 scales on a tree 12 years old. Before, our trees were very slightly to badly affected by the oyster shell bark-louse. What was my surprise to find that the trees were perfectly clean; the bark was of a much healthier appearance and it seemed to make the trees more vigorous during the summer. It seems to me this is very important, and I have started a series of experiments this time to confirm my experience of last winter and find out how much white-wash it takes to kill the insect. My method is to keep the trees perfectly white from February until the latter part of April, and I want to find out how many sprayings it will take. It is possible that it is the smothering of the insect that kills it, and I am very anxious to find out just how much to apply. So what I have done is to treat certain trees with one application, certain trees with two applications, others with three and four applications, and I shall probably carry it up to six. This I started last month and shall probably keep it up till next May. I may say that I am going to St. Catharines to-night to try and arrange some experiments there to treat the San Jose scale in this way, because I cannot see why, if the oyster shell bark louse is killed, the San Jose scale cannot be killed also.

Dr. Mills—Is it simply a solution of quick lime.

Mr. Macoun—We take the fresh lime and slack it in warm water, and our mixture was made up of 6 gallons skim milk, 24 gallons water, 60 pounds of lime. Two pounds of lime to the gallon of water. It was strained through a twelfth of an inch mesh. It makes very thick white-wash.

Q.—Why do you use milk?

Mr. Macoun—It makes it stick better, and I believe salt makes it stick better still.

REPORT OF EXPERIMENTS ON SOIL MOISTURE.

Prof. J. B. Reynolds, Director of Experiments in Soil Physics, Agricultural College, Guelph.

Only one successful experiment was conducted, by Mr. H. R. Ross of Gilead. The purpose of the experiment was to examine the effect of various methods of treating the land after seeding. Six plots were sown, three of oats and three of barley. One plot of

each was rolled immediately after sowing ; another was rolled and then harrowed ; and the third was not touched after the drilling was done.

They were sown on May 5th, and on the same day a sample of soil was taken from each plot for moisture-determination. Samples were taken again on July 3rd, and again on the days when the grain was cut, July 28th for the barley, and August 5th for the oats.

Early germination. On May 12th, one week after sowing, a count was made on each plot for sprouts, within a given length on a drill row. Two days after another count was made in a similar way.

Yield. The crops from the various plots were kept separate and threshed separately, and the yield of each calculated in bushels per acre. The results of all these determinations are given in the table below.

		Oats.						Barley.					
	Treatment.	Drilled.		Drilled and Rolled.		D., R. and Harrowed.		D.		D. & R.		D., R. & H.	
		1st foot.	2nd foot.	1st foot.	2nd foot.	1st foot.	2nd foot.	1s foot.	2nd foot.	1st foot.	2nd foot.	1st foot.	2nd foot.
Per cent. of Moisture.	May 5..........	24.3	23.5	24.2	24.8	23.5	24.0	24.3	25.5	26.7	24 1	26.4	25.5
	July 3..........	19.9	21.3	16.0	23.0	20.5	19.5	18.8	21.0	20.7	20.6	19.1	22.5
	July 28..........	......	......	......	......	......	......	13.7	17.9	15.5	15.6	12.0	17.4
	Aug. 5..........	16.2	19.4	13.0	19.2	15.8	19.5	.....	......	......	......	......	......
No. of Sprouts.	May 12..........	21		17		26		25		19		27	
	May 14..........	27		25		27		41		38		36	
Yield..................		51		49		55		24		23		26	

Conclusions : In both kinds of grain, the complete treatment, that is, the drilling, rolling and harrowing, gave the best yield and the drilling and rolling the lowest yield. Comparing drilling simply with drilling, rolling and harrowing, the latter treatment increases the yield in both cases by 8 per cent. Comparing drilling and rolling with drilling, rolling and harrowing, the latter, that is, merely harrowing in addition to the former treatment, increases the yield in both cases by 12 per cent.

The causes for the increased yield are apparently two : First, leaving the land rolled without loosening the surface afterward seems to retard germination. In 9 days the number of sprouts in the plots under the different methods was practically the same, but in 7 days there was a difference of 50 per cent. in favor of harrowing after rolling. The germination in the plots that were rolled was therefore slower. Secondly, the texture of the land was injured by the rolling. The soil under experiment was a heavy clay, and the rolling puddled it more or less. As regards the moisture, in the oat plots the harrowing seemed to conserve the moisture, while in the barley the harrowed plot contained less moisture in the last two determinations. But it must be borne in mind that moisture determinations made on land that is growing crops are uncertain and inconclusive. For if one plot has more moisture than another, it will produce a larger crop, which crop will in turn demand more moisture to sustain it, so that the plot that began with more moisture as the result of better treatment or for other causes will likely at the end of the season have less moisture than the worst treated plot. At any rate, since the moisture is onlp a means to an end, and the crop the end sought, the fact that the one method of treatment gives a much larger crop is the fact that we wish to emphasize.

THE PHILOSOPHY OF SOIL TILLAGE.

George T. Powell, Ghent, N. Y.

The subject for discussion this afternoon is the Philosophy of Tillage. I do think it is one of the most important subjects we can study. The science of agriculture depends on understanding the principles which underlie tillage, and it does become of great importance for us to understand as much as we can of the subject. If the question is asked the average audience of farmers, what is the objection of tillage? I notice many give the reply, to destroy weeds; others say to properly prepare a seed bed; and yet if we were to take the first reply—to destroy weeds—I think we should find our soil would lack very much in the process of tillage, if we tilled from that standpoint. So we may be thankful that weeds have been sent to occupy our soil and force many farmers to destroy them, where that is their understanding of tillage. As I understand it, the main object of tillage is to make available the plant food which is in the soil, that the seed which is planted there may may find what it needs for its support. So I look upon tillage in its fullest sense as the supreme effort to obtain the liberal supply of plant food which our plants must have. I cannot look upon our soil as by any means exhausted of plant food. We hear the statement so often made that one of the reasons for the small and low compensation in farming to-day is that our soil is exhausted. I do not believe it. I believe our soil to-day is abundantly supplied with plant food, sufficient to meet the wants of generation after generation yet to come, but it is the question for future generations, it is the question for the present generation, to know how to get at the plant food which is still abundantly stored in our soil. And so I look upon tillage in its most important sense as getting still further at plant food. As we look back over the history of our country we recognize that the soil has been abundantly blessed with wealth. We see as the result of the taking out of this plant food from the soil the splendid conditions which are about us to-day in the farm lands, the improvements which have been brought to those lands, in the excellent buildings, in the good condition of fences, in much of the under-draining which has been done, in the comforts which have been brought about the farmer himself, in the liberal education which he has been able to give to his children. All this is representative of what the soil has been doing. It is the wealth of the soil which has enabled farmers to bring about the present condition of improvement which we recognize, and bring to their families comfortable living and the advantages of a liberal education. Now, the great problem of the future is, how can we continue to obtain these blessings? How can we go on and make still further improvements? How can we send more boys to college? Not one, but two or three perhaps. That is the question, and the soil must answer the question in every instance, because the soil is the farmer's bank. He must draw upon his soil for his resources, and tillage comes in here as a very important factor in his operations to enable him to obtain wealth from the soil. Then we need to understand the philosophy of tillage; we need first to understand the implements. We need to very carefully understand the principles upon which plows are constructed. We have, perhaps, not thought enough on this question of the construction of plows. I know in my own experience, in meeting with farmers and the manufacturers of agricultural implements, that one of the claims which to-day are put forth more than ever, is that the plow will go through the soil with the easiest possible draught. Sometime ago I had an interview with a couple of implement agents. One of them said that his plow was so perfectly constructed that, when properly adjusted or set, it would run a certain distance through the soil without any one holding the handles. The other agent said he could not make such a claim as that. So the two plows we set to work, and we followed them about the field. The one did exactly as the agent said; when it was properly adjusted it would start and run and turn the sward up for quite a distance without throwing out of the ground. The other plow wouldn't go half the distance. Now, when they had been running for sometime we examined carefully the condition of the soil, and the difference in the condition of that soil was very marked indeed. Having made up by mind with regard to the two plows, I said to the men working them, "Which of the two do you prefer?" They replied, "We like this easy running plow" I said "That is just the plow I don't like." Then came the reasons for it. The easily driven plow merely ran through the sward and spread it and turned it with the least

possible resistance. The plowing had a fine appearance, as far as plowing might be considered from that standpoint. The other plow left the soil in a very different condition. From the moment it started into the sward the operation was different. It was continually breaking and twisting and grinding that soil every moment it was working, and that was the plow doing the best work altogether. A little harder on the team, on the man holding it, but it in its turn was accomplishing just what we want in a plow; that is, was reducing the soil and putting it in the mechanical condition by which plant food is going to be made more valuable. The first process of tillage should start with the plow itself. It is not this very finely constructed plow which will simply glide through the soil and turn the furrows with the least resistance which is best, because that is not doing what we want done with the soil. We need to study the construction of mouldboards and landsides, that when we purchase a plow we may understand that that plow is going to reduce and refine and pulverize the soil every moment it is working. That is my understanding of a good plow. It is not the easy draught, the light running plow, but it is the one which is the most thoroughly manipulating and reducing this soil to the finest possible condition while it is passing through.

Now the next point would be in the implements which follow. Every implement which follows the plow should work upon this principle of passing through the soil and reducing and grinding and pulverizing it; in other words, liberating the plant food. And so we should study the construction of cultivators that will do the work the most completely and thoroughly every hour we are working with them. With our soil well supplied, as it is at the present time, with the necessary elements of plant food, not so available, perhaps, as half a century ago, still, if we understand that our soil is abundantly supplied, as it is, then we shall understand the philosophy and the real object of tillage. That it is simply to get at this plant food, and that it is more economical for us to get at that which we have under our feet than it is to put our hands in our pockets and take out hard earned dollars to purchase commercial plant food. The real object of tillage is that, before we spend one dollar on artificial plant food, we use what is under us in abundance. I think I will not dwell longer on the real underlying principle of tillage; I trust I have made that point clear to you already.

The next point which seems to me of importance is that which has been discussed by Prof. Reynolds—that is, the control of moisture. I think the lesson which was given by that gentleman is of very vital importance. We do need to understand so much about the control of the moisture. It is a fact that were we to depend on the annual rainfall—that is, upon the rainfall during the growing season—we should certainly fail in the large majority of fields we are cultivating, because we do not have during the growing season nearly enough rainfall to carry our crops through. We have to depend on the moisture which is stored up in the soil during the previous months for the growth of vegetation. Our main dependence lies in the amount of water which is available in our sub-soil. So I look on tillage in its secondary importance as really working to conserve and utilize in the best manner the moisture which is in our sub-soil. Tillage should be carried on in the second instance with reference to supplying the deficiency that in nine times out of ten will come to us in the growing of our crops. This is done, as has been clearly explained by Prof. Reynolds, in the methods which have been pursued here in your experimental work, by so handling the surface tillage that you can conserve and hold back the moisture which is taken from the sub-soil. Now it is an exceedingly interesting study, to those who observe closely and carefully, to note the action of the sub-soil conservation of water. You who have cultivated open fields will recognize this, that were the rolling has not been done, when you have finished your field, and if there should come a dry period immediately following the seeding, you will notice that in the morning where the horses' feet have pressed the soil you can see the moist places across the field following the footsteps of the horse. And so you have done by the horse exactly what the roller has done; you have compacted your soil and made it possible for the sub-soil water to come to the surface. These are the things which pay the farmer, and particularly the young man, to observe closely and note the effect of the action upon this soil by the tramping of the horses' feet, and it gives him the suggestion that he must save that for future use, and not have it pass off without benefiting by it. It is a very difficult thing to explain this action of the water on the soil. Of course we study to learn about capillary action, but who can

explain what that is? The scientific man becomes interested in the study, but what is capillary attraction? What is the power and influence which is constantly forcing water upwards in the soil? It is a difficult thing to explain, yet we have studied for many years about the principles of capillary action. If we could take a cube right out of the sub-soil we should find some exceedingly interestings things; if we could only watch the movement of the water in the soil; if we could only look into it, and there could watch and see this movement of water, which is not always upward, but which is in all directions until it finally reaches the surface of the soil, we should see some exceedingly interesting things, but after all difficult to explain. We know it to be a fact that there is a constant seeking of the water to escape, and this is particularly true as the temperature becomes heated. Tillage should be with a view to holding back this supply and conserving and utilizing it to the best possible advantage in the growth of our plants. This is where frequent surface tillage comes in, and as the hot days increase the surface tillage should be more frequent. The effect, of course, is to cut off this escaping water which is constantly pressing to the surface and passing off by means of evaporation. Now, by the constant and frequent movement of the soil on the surface we seal, as it were, the water below, and here comes in the value of understanding the action of water in sub-soil, that we may utilize it through the medium of our plants in passing off by evaporation into the atmosphere.

Now, to apply this to the farm. I will take for illustration the orchard, and apply this principle to trees. We have had an illustration of the oats and barley, and we will carry it now to the field in which the trees are planted. Suppose we have here in the orchard trees of any kind, apples, pears, plums or peaches, and their roots are all through the soil—they are extending in every possible direction. If we can understand this principle of the upward movement of the water and tendency to evaporate rapidly as the warm days increase, we shall understand the necessity of tilling the orchard; we want to hold it in reserve for the roots of trees, the same as of plants. So tillage is as vitally important for the control of the water in the soil as it is for getting at the plant food. In fact, we cannot get at the plant food in the soil for use in those trees until we have the water there to work with us. It is through the action of water upon the potash, upon the phosphoric acid and nitrogen in the soil that we get its preparation properly for sustaining all plant life. And when we understand that principle, and apprehend in its fullness the value of water to utilize the plant food, then we shall understand the real and true philosophy of tillage. Prof. King, I think it is, who has given us this illustration in his calculations. That an ordinary elm tree of 25 or 30 years growth will eliminate from the soil in a single twelve hours not less than seven and three-quarter tons of water; that is, an elm tree with all its foliage upon it will draw up and pass off through the agency of its foliage not less than seven and three-quarter tons of water in twelve hours. Now just look at the wonderful amount of water which is utilized by a single tree like the elm. I think he also makes this further calculation. That one acre of meadow grass will take out of the soil in water 106 tons in every twenty-four hours of the dry time. Just look at it for a moment, and comprehend the statement. That in every twenty-four hours of dry time in June, when the grasses are in active growth, they will eliminate from each acre of soil 106 tons of water. You will see from this that it is utterly impossible to depend on the rainfall to keep our meadow grass thriving during the dry season of its growth, and how great is the supply of water in the sub-soil when one acre of meadow grass will eliminate 106 tons in twenty-four hours. It is important that in all our methods of tillage, in orchards and in fields of grass, we get this surface in a condition to prevent the passing off of moisture except through the plants we want. In the grain field and in the potato field, and in all our cultivated crops, how important it becomes that the soil be kept clean and free from weeds, because they are there as hundreds of thousands of pumps, pumping up the water and passing it off through the atmosphere. Here is where tillage is valuable in the destruction of weeds, that it shall prevent the robbing of other plants of the water which they require. I want to give you a practical illustration direct from my own farm. We have been suffering for a number of years from long protracted drouths; they seem to have become the rule of late years either earlier or later in the season, and so for a number of years I have been working on the principle of expectancy of dry condi-

tions, and have planned for it in the spring time especially. I want to speak of the importance of early tillage and the value of conserving the moisture from early in the season. This movement of water in the soil begins far earlier in the spring time than we realize. One week's delay in stirring the soil may cause us the loss of hundreds of tons of water, and thus the importance of turning it over on the surface just as soon as the soil is in a condition to work, and holding in the water which is beginning to move on the approach of spring days, I think it is safe to say that the difference in one week has made a loss of over 200 tons of water per acre, in land that was plowed at one period and another piece left unplowed. The loss of 200 tons of water per acre in the spring time may make the difference of success or failure with the crop being cultivated for the season. How can we aid our soil in the holding and conserving of water? On my own farm I have been using clover for several years as a special means of holding in check a very large quantity of water during the season. In addition to tillage, I have been for a number of seasons utilizing the clover plant, in this instance the crimson clover, and I will be glad to give you my special reasons for using crimson clover.

In the first place, we start very early in the season. We begin as early in April as the ground has settled sufficiently to put the teams and plows upon it, and keep it up continuously in our orchards, and also in our potato and turnip fields; we push our tillage actively until the maturing of these crops. This constant use of implements has left the soil in a condition which, if left in that condition for the rest of the season, is going to be most disastrous to the soil. If you have tilled to the extent I have described this afternoon, in the following months of rainfall that soil is going to lose heavily; it is just in condition to be drenched and soaked, and to have its nutrients wasted out to a great extent. We must provide against that loss. We can save the after loss by putting on a cover crop; and the special value of cover crops has been very carefully studied by your own station and College, and by almost all the stations and colleges in our country to-day. Taken in connection with high tillage, the subject of cover crops becomes a very vital and important one. I have beon using crimson clover for this reason. We push tillage right through our orchards in New York State up to the middle of July. By that time we have the supposed growth of our trees; we have the development of our fruit buds for the following season, and then tillage should cease. Now, at this point we want to cover the soil with a crop which will protect it during the balance of the autumn and winter seasons. The crimson clover being an annual plant grows more rapidly than any other within a given space of time. The red clover is just as valuable but is slower in its growth, and hence in New York State we cannot get so complete a covering on our fields during autumn by red clover as we can with crimson. It may not be suited to your soil and climate here in Canada, but other crops can be used in place of it.

Now, as to the results of this system of clover culture. While conducting a series of Horticultural Schools in New York State for Cornell University, one of the chemists of the University was with me as an assistant, and in listening to the discussion on tillage and the use of clover the chemist put this question to me one day, "Do you know what you have been doing in your soil?" and I said "No, only in a general way. Not being a chemist, not being a scientific man, I have no way of determining only in the general results." Then he said, "Give me two samples of your soil, one in which you have been following this system of clover treatment with high tillage, and another sample of soil where the tillage has been carried on without the aid of clover, and I will try to determine what you have been doing." We cultivate in our orchards but six inches deep, and so soil to the depth of six inches was taken in order to get at what had been going on with the use of this clover, and the following was the result:—

	Three crops clover.		No. clover.	
Water	15.00	per cent	8.75	per cent.
Nitrogen	.21	"	.12	"
Humus	2.94	"	1.91	"
Phosphoric Acid available	.015	"	.008	"

Following on this line of figures the following is a further explanation:—

Water	6.25 =	46875 tons.
Nitrogen	.09 =	1350 lbs.
Phos. Acid	.007 =	105 lbs.

Now the surprising point was in the results which he found in nitrogen. I need not spend time this afternoon in explaining this, because you, as students, understand the philosophy of the leguminous plant and its ability to add nitrogen to the soil. Taking the least price for which nitrogen could have been obtained it would have cost me $250 per acre to put the nitrogen there which the chemist found had been put there by the planting of thé covering. Now, another very important point is that no matter how much nitrogen had been added, no matter how much available phosphoric acid had been found in the soil, and no matter how much potash, if the water had not been there to work on these elements it would have done my plants and trees very little good.

It comes to me as a new inspiration in farming to think that it is possible for us to go on and push cultivation to the extent to which I have explained this afternoon, and get the increased production at the end of all these processes. After having taken all this production from our soil it is richer when we get through than when we begin. That is the inspiration that comes to us in the possibility which lies before us in the use of tillage, and by the incorporation of these leguminous plants, to leave the soil generations beyond to-day better than it is at the present time. I want to say in conclusion that the future has so much of promise to young men who will take up the practice of tillage and agriculture from the standpoint of scientific discovery. I do believe that in the matter of tillage we have hardly yet learned the first lessons of importance, and in proportion as we discover and apply these important principles we are going to lift agriculture to a higher and higher degree of perfection.

Dr. Mills: You say your cultivation is continuous from the time you get on the ground in the spring until July. What do you mean by continuous cultivation?

Mr. Powell: For instance, we start in the apple orchard. We will plow that orchard. Just as soon as we can get on to the soil in the spring we will plow very lightly. Suppose we have clover on this ground bed, we put the plow in just about 4 inches deep, in young orchards 6 inches. Then we try to cultivate once a week with a cultivator. We use the spring tooth cultivator. We do our deepest cultivation early in the spring. When the weather becomes dry we put on the leveller.

Dr. Mills: Do you attempt to clean up around the trees at all?

Mr. Powell: We go as close as we can reasonably, going in both directions. We usually get pretty close.

Dr. Mills: Plow to the trees and away from them?

Mr. Powell: We plow to the trees one year and away the next. That keeps the ground level.

Dr. Mills: Do you cross plow much?

Mr. Powell: We plow one direction one year and the other direction the next year. We keep our ground level in both directions.

Q — How is it that we used to grow good crops and didn't give it half the cultivation, and we had from 25 to 30 bushels of spring wheat to the acre on the farm I live on, say ten or twelve years ago, and now have only been able to raise six or seven acres of straw?

Mr. Powell: Without, of course, being able to go upon the land and examine it, it seems to me that there may be two or three causes ascribed. First, I think the mechanical condition of our soil is not the same as it was half a century ago. Secondly, when the mechanical condition of our soil is not right from various causes, such as continuous cropping, or perhaps the solidifying for want of a sufficient amount of humus, the water action of the soil becomes difficult. Plant food may be there, but not available. I have no doubt in my own mind that there are a great many acres in your country as well as in my own that would be greatly improved by the use of lime. We begin to realize in New York State that the action of lime is very important on land where we did not think it was at all needed, and I think that next to under-draining the use of lime may be a subject for special investigation in many sections of the country where it was supposed no lime whatever was needed. To give you an illustration. On my own place to-day I find absolute failure for certain varieties of cherries to grow, the Black Tartarian, one of the choicest of all varieties, and another variety which used to flourish years ago, to-day if I plant the trees they die in that same soil. The soil is apparently in better condition than when my father raised cherries, but with all my system of til-

lage and use of clover and the best intelligence I can bring to its management, those trees die on the same soil on which they used to flourish. What is the reason? On the sandy soil of Rhode Island, where it was not supposed they could get any favorable action from lime, they find it is what the soil needs to-day. And I was pleased while at their College this last summer to go out on a sandy plain around the College, and find Black Tartarian flourishing, and on another strip where lime was not used it was dying. So I should say in a general way, investigate and experiment. I would put some lime upon your corn, potatoes, grasses, and see if there may not be a favorable result. By becoming an experimenter, you will help yourself and the Experimental Union. With regard to new land, I think we have lost immensely by the destruction of our forests.

G. E. Day—I am sure that with myself you have all been delighted with the able and practical address which has just been given. It seems to me that the ground has been thoroughly covered and there is very little room for discussion on many of these points. I would just like to say with regard to soil moisture that our practice here regarding rolling has been to postpone the rolling until after all the seeding was completed, and by that time a good deal of the grain has germinated; in fact most of the grain is above ground when the rolling is performed, and we have not practiced harrowing after the rolling because our crops are sown with clover, so that harrowing would be impossible. With regard to the question of tillage, it seems to me that an extremely important point was made by the last speaker in emphasizing the importance of making use of what plant food we have before spending money in buying other fertilizers. People throughout the country are spending thousands of dollars in commercial fertilizers and things of that kind, and entirely overlooking immense stores under their own feet; and the question of tillage is of extreme importance right along that line. In connection with this question of humus—and I believe that we are looked upon at this station as "humus cranks"—the trouble is in a great many farms that the humus has been distributed. through rather too much soil, and right there comes in this question of depth of plowing. I was very much pleased, indeed, to hear what the last speaker had to say with regard to depth of plowing. He said they plowed about four inches deep. People will say, "Look at Great Britain, which is noted for its deep plowing; and in Germany, where agriculture has been brought to a high degree of perfection, they plow some 16 or 18 inches deep." This may seem somewhat contradictory to what we advocate here, and yet I do not think that such examples furnish anything like a criterion for our guidance, for the reason that where very deep cultivation is practiced extremely large quantities of fertilizers are supplied—very much larger quantities than are available to the average Ontario farmer. The trouble in this country is the large tracts of land which we cultivate. The amount of stock we keep does not permit us to cover that land sufficiently frequently, and consequently if we dilute the amount of humus we put on the land with a large amount of soil we are destroying the effect; and as the fertilizers which supply humus are comparatively limited, we believe that humus should be concentrated where it will do the most good, which is near the surface.

W. N. Hutt—I would like to ask Mr. Powell if he does any cropping in a young orchard or to what extend?

Mr. Powell—In planting a piece of ground to a young orchard it is a question with many who have not capital, how can they get a quick return from that soil? And very many, not having enough money to start with, have to purchase land and incur indebtedness upon it, and this becomes a very vital question to such. I advocate the cropping of land in young orchards under certain conditions. For instance, if you have a market for small fruits I put small fruits in the space. I plant currants. I would start the first rows of currants seven feet away from those trees. Plant nothing nearer than seven feet. You can keep up your tillage, you can improve the soil all the time the trees are growing. Then with the currant or strawberry culture you can afford to put some money on a crop which is to bring you a return next year. Feed each crop with commercial or artificial plant food, and so long as they are there the soil is kept improving around those trees. Now, if you are not situated to grow the small fruits, then the question is can you grow your potatoes in a small orchard? I think you can if you follow the same practice; if you feed the crop with plant food you can crop the soil for at least three or four years. By following the clover culture you keep up the condition of your soil, that s, you are not robbing it of its essential element, nitrogen; you are re-incorporating lost

humus by clover or peas, and so keep the soil up to a high condition of productiveness, and at the same time taking off those crops. As soon as the orchard comes into bearing then remove everything but the trees themselves.

Q.—What is the proper depth to which under-training is profitable?

Mr. POWELL—That would depend on the character of your soil, the tenacity of your sub-soil, whether hard clay or more open and porous. If your soil is clay you do not need to go quite so deep; you want to get that surface water away rapidly from a clay soil. If you have an open porous soil let your ditches go a little deeper, because you can bring back again your supply to the surface.

CELEBRATION OF THE QUARTER CENTURY ANNIVERSARY

OF THE ONTARIO AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM.

The following address of welcome to ex-officers and ex-students was given by Dr. A. E. Shuttleworth, Ontario Agricultural College.

To the ex-officers and ex-students:—

The occasion is one which does net call for a long and full speech, but at the same time it is an occasion of great responsibility; it is an occasion which deserves very warm appreciation. The ties which are formed at College are warm, are peculiar; they are not easily broken. It matters not how you may change your position, how far one may be from the other, it matters not what may come to alter the manners and thoughts of either, if there has been formed a tie of warm friendship at College that tie is never broken, that friendship is never forgotten. Twenty-five years have rolled by since the opening of this College, and this long time has certainly resulted in forming many warm ties and friendships. We have students with us who belong to the first year of the history of the College, and no doubt students belonging to all the other years. Think of the number who have met here and the pleasure there is in renewing these friendships. I say it is a responsibility to be asked to give expression to these sentiments which should fill the hearts of us all on an occasion like this. No one knows, except those who have actually experienced it, how enjoyable a meeting of this kind is for those young men who have been far away for many years. In speaking upon this occasion I have to consider a great many people. Some 1,600 or 1,700 ex-students have their names on our books; same thirty ex-officers also are to be remembered. We find that of those 1,600 or 1,700 ex-students some 1,000 have responded to the letters of our Secretary. I would fall far short of my duty if I were to simply speak of the joy and happiness we all experience in coming here, and forget to say that many of our brightest young men, many of our medallists, have passed away as the years have rolled by. Some of our ex-officers have also passed away, and some so lately that their faces and places are familiar to most of us gathered here. This is a dark spot in the happiness we enjoy to-night, but it relieves that darkness to remember with pleasure the memory of those who have passed away. It is not too much to say that our students are becoming more and more appreciated in the counties in which they live. It is only a few days since I was in the counties of Welland and Haldimand, where a well educated farmer came to me and said, "We are proud of your boys down here; they are doing us good." I say our young men are becoming more and more appreciated in the counties in which they live because they have real worth—worth of education, and that is of great value in a country place. I do not wish to say a word against the hard working farmer of the country, but we have many farmers, good honest men, who have not had the advantages our young men now have. When I say "worth of education" I mean an education that is of practical use, whatever else it may be. So you have real worth in education, in character, in industry, and in something else, in politeness. As students of this College let us not forget, while we are engaged in the calling in which we love, that virtue which is spoken of as gentleness and politeness. Further, our young men are appreciated in the counties in which they live because they are enterprising. I have met farmers who, being surrounded by farmers much less enterprising, have been held back.

Ex-students and College graduates, who number now a great many, I think owe something to this College. I am sure there is not one who will rise and say he owes nothing to this College. We, and I am speaking now of the College, cannot afford to be independent of the people of our country. We, as a College, require backing, require sympathy, require encouragement. We get sympathy, we get assistance of a very substantial kind from our ex-students scattered here and there all over the country. So that the College and the ex-students are of a mutual benefit to one another, and the time will not be long, I do not think another quarter of a century will roll by, before our young men, to whom I am now addressing a few words of welcome, will number so many that their influence will extend far beyond the counties in which they live. It is beginning to extend to political matters. I do no mean as members of parliament, that will come in the natural course of events, but your influence as farmers in the Province will extend from county to Province, from Province to Dominion, until we as a College feel that our great backing comes from our graduates themselves, and that is the very best backing any college can have. I speak these words of welcome on behalf of those at the College to our ex-students and our ex-officers, and I am sure that upon this occasion you will appreciate the sentiment of the poet expressed in the words,

"Thus we salute thee with our early song,
And welcome thee, and wish thee long.

RESPONSE ON BEHALF OF EX-STUDENTS.

By Nelson Monteith, B. S. A., M. P. P.

The occasion upon which we have met here to-night is one which touches a responsive chord in the heart of almost every ex-student and student, the Annual Re-Union; and I am pleased that as years go by it is looked forward to even more and more as an occasion of rejoicing, I am pleased to-night that we have such a very large student and ex-student body. With regard to the vastness of the freshman class, it has outgrown former years entirely, and I only regret that the percentage is yet so small. I hope in years to come greater accommodation will be provided for the education of farmers. On being asked to respond on behalf of the ex-students the thought has come to me of the vastness of the constituency which I represent—it is world-wide. We inherit this British instinct of adventure which has sent forth British mankind wherever they exist, and I respond to-night for men in every clime; our students have gone to better themselves in every land, and I know I only voice the sentiment of those ex-students when I say that that spirit animates almost every one of them. I feel that the memory of days spent here and the lessons learned will help in their lives. With regard to what a previous speaker has said as to the number of ex-students who have gone back to agriculture, the percentage does not seem very large, but when you compare it with other seats of learning, such as the High Schools, the result is very much in our favour. Only the other day I was looking through a report of the Department of Education, and it does not make the showing of this College in regard to sending men back to the farm. Almost 75 per cent. of our students have gone back to agriculture. whereas of the graduates of High Schools in that report, though over one-half came from the farm, less than one-quarter went back to the farm. We must look largely to the Ontario Agricultural College to right this matter; and I trust, as I said before, that ample accommodation may be made for the number who wish to study agriculture. I may say in conclusion that we appreciate the remarks made by Dr. Shuttleworth. We feel and we respond to the sentiments expressed in his address. I trust that every student on going out from the College will feel it his duty to maintain the honor of the institution. It is a broad sentiment which has been taught us here, and I trust we shall carry it into our private life, and do the very best circumstances will permit us to do, and if we put the right amount of energy into it, in this young and growing country, we have, I may say, the matter in our own hands. I thank you on behalf of the ex-students for the kindly reception you have given me and have ever given to us at this Annual Re-Union, and I trust that we shall come up annually to be reinforced and re-strengthened for the year.

RESPONSE ON BEHALF OF STUDENTS.

MR. E. C. DRURY, STUDENT, ONT. AGRIC. COLL.

A minnow, carried by the tide far from the quiet waters of his native bay, who found himself floundering in the deep sea among many great whales, would feel, in many respects, as I feel to-night. Yet I differ from the minnow in one regard. He would not be backed up by the sense that he was the mouthpiece of the other minnows. To-night I come before you charged with a most hearty welcome from the students of the O.A.C. to the members of the Experimental Union and those others, not members, who have shown their interest in the work of the Union and of the College, by attending this meeting, the 25th birthday of the Ontario Agricultural College.

During the past years, the Union has done a most valuable work, in increasing throughout the Province the interest in agricultural education. The experiments worked out through its instrumentality, and the knowledge scattered broadcast among the people through its labors, must have had a very great influence in stimulating the desire of the Ontario farming classes for more and better agricultural knowledge. Yet it is not in this that its noblest work has been done, but in keeping the ex-students united to their Alma Mater, and in promoting that broad college spirit without which no college can do its best work. I believe that in this respect its work in the future will far exceed that of the past, for now, I am happy to say, there is a better college spirit growing up among the students of the O.A.C. than ever existed before. In the future, more than ever before, we may expect to see the ex-students united by a common love for their College, and the Union will be the means whereby this love is fostered and expressed, and the work of the College expended among the people of Canada.

I would like, if I could, to draw a picture of the future, and show you what the fiftieth birthday celebration of this College will be like. So I must ask you to accompany me in your imaginations over 25 years, and imagine that you have written at the top of your last letter not 1899, but 1924. In that time it is reasonable to expect, since ours is one of the greatest domains of earth, that its face will have been much changed and improved. Our northern districts will be dotted with the chimneys of factories and farm houses. Mining towns will have sprung up as mushrooms in the night. The great prairies of the west will have yielded their wealth to the skill of the husbandman, and will be the homes of happy multitudes. In short, from the Atlantic to the Pacific, our country will have reached a stage of strong and noble maturity. It is the end of the year 1924. The green robe which covered our fair country in the Spring has grown old and shabby, has been dyed over by Jack Frost, who, not satisfied with his work, has finally stripped it off altogether and left the woods and fields bare and nude to the keen blasts of advancing winter. Our Lady of the Snows, beautiful then as now, though somewhat older, is preparing to don her famous white coat. From east to west, the husbandman has prepared for the coming of winter. The splendid herds and flocks of Ontario have been housed. The great wheat crop of the west has been harvested and threshed, and is rolling on its way to distant markets. Throughout the land the grey plowed fields give evidence of the industry of the farmer, while well-filled barns tell us that skill and labour have been rewarded bountifully. And now the whole land is waiting for the first white heralds that tell of the approach of the winter king. The colleges of our country have opened nearly two months ago, and thousands of the youth of Canada, and hundreds from other lands, have flocked to these seats of learning. Among these, the now famous O. A. C. has opened, and crowds of students passing from lecture to lecture as the old familiar bell rings out the hours, tell us that the work of another year in that flourishing institution has begun. In short, the autumn of a prosperous year has passed for Canada, and has brought round the day for the fiftieth Anniversary of the Experimental Union of the old O. A. C. Invitations have been sent to ex-students throughout our own land, and to far lands, whither our students have wandered. Old, middle-aged and young, they come, and again climb the old familiar hill, not on foot, as in days of yore when cash was short, but in the easy trolley. I am with them in spirit and look with pride upon the men who have shown themselves worthy of the old O. A. C., who have now the trust and confidence of their fellow-citizens, and have filled every position of public trust throughout the land, from Member of Parliament to Pathmaster.

There are some among them whom I recognize as belonging to the years in which I attended the O. A. C. Here I notice a small, wiry old gentleman, who evidently does not belong to Canada, but to some other portion of the Empire, possibly Bermuda. I think I recognize him, for his eye has lost none of its old-time brightness, though, alas, the luxuriant brown hair which crowned his head in happier days has disappeared, and in its stead rises a shiny white dome, fringed with a scanty line of grey. The narrow, perfect part which once separated his rich brown locks has with time widened into a regular drive-way. He is talking to another gentleman, a lean, starved man, with glasses on nose, and long arms, which show a strong desire to gesticulate frantically as he talks. He speaks with a slightly foreign accent. I think I recognize him also, but, Oh, what a change from the athlete of old days to this lean and shrivelled old man. One more I recognize. He is a fat and comfortable man, with double chin and portly form. He is reported to have succeeded rarely as a feeder of swine in the eastern part of Ontario. His old-time gallantry has not deserted him, for he is doing his best to monopolize two young ladies just across the car from him. He talks to them industriously, and as he talks he gasps for breath, for he has waxed fat and short of wind. Oh, Gurth, Gurth, can this be you? You, pugilist, poet and pig-feeder in your college days. How long is it since thou sawest thine own knee? Verily, time has dealt hardly with thee. Many more I recognize, but time will not allow me to mention them.

I might dilate at length upon that great gathering, upon the hundreds of students who are lined up to receive the visitors on the lawn, and who give the old familiar, barbaric college yell as the visitors approach. I might tell you of the hundreds of fair maidens who have come from the School of Domestic Science across the way to meet the visitors, and who are as beautiful as a bed of spring daisies, but I must leave all this to your imagination. I must also leave to your imaginations the great meeting in the Convocation Hall, and the eloquent speakers who address it, and the great dinner in the immense dining hall. You will no doubt fill in these minor details much better than I could, and gain a much better idea of the scene than I could possibly give you.

There is, however, one element of sorrow brought home to us in the contemplation of this picture. The inevitable law of nature demands that I should leave out the faces of some of those who are now with us, for as the future becomes the present and silently glides into the past, the stream of time will waft many of us into the unseen world. It would not be manly for us to avoid this element of consideration; it is Christian that we should be aware of our transiency. We can, however, hope that but very few will have passed from this land of shadows into the land of shades. I can do no better than express the wish that most of us here may live to enjoy the great meeting I have pictured in 1924.

In closing, allow me to express again the hearty feeling of the students of the O. A. C. toward the members of the Union, and the deep interest they feel in the Union's work.

RESPONSE ON BEHALF OF THE EX-OFFICERS.

PROF. J. W. ROBERTSON, AGRICULTURAL AND DAIRY COMMISSIONER FOR THE DOMINION.

I am very thankful to be hear to-night, and am very sorry I was not in time to listen to all the proceedings on this most interesting occasion. Since I became an ex-officer of the College I have ceased to be a gentleman of leisure, so I had to address the Fruit Growers' Association at Whitby last evening and the Bee Keepers' Association at Toronto this afternoon, and had about four minutes and a half for supper in Guelph instead of two hours at a banquet. I am glad to be here to-night to say how proud I am to be one of the ex-officers of the O. A. C., and of the wonderful progress this institution has made during all these long years when its officers and students have tried to spread the advance of education in Ontario. Since I left Guelph I have had a chance of seeing the foremost Agricultural Colleges of England, the foremost Agricultural Colleges of France and Denmark, and I can say honestly that none of these in scope or efficiency compare with the Agricultural College in Ontario. The only superiority I found was in ome places in Denmark, where the students rise promptly and punctually at four

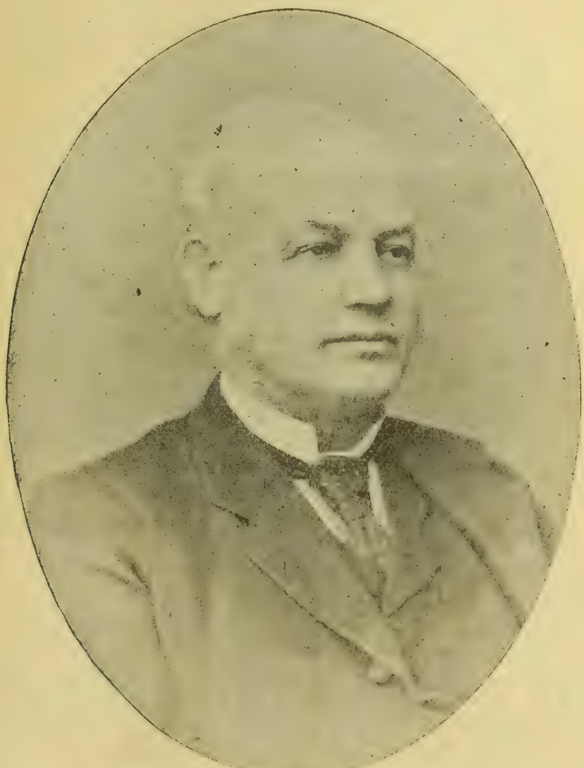
o'clock in the morning, and pursue their studies uninterruptedly in the field, in the stables, in the dairies and in the sugar factories until 7 p.m. and take all their recreation on Sunday afternoon. The object of this College has been attained in a measure. During the time I was listening to the excellent exposition by the President to-night I could realize better its main object and use in this Province, to increase intelligence not only by the diffusion of information but by the other means of increasing intelligence, which is having the students do things by themselves for themselves, skill to promote and manage the common things of common life. What is the use of knowing Greek and Latin if men and women do not know how to do the commonplace things in the common sphere of activity? Then the College has had a great deal of success in forming correct habits in those who pass through its halls; conduct and good manners; the sum of all excellent life, to so conduct one's self as to bring about the right thing in the right time and the right place. A long time ago I can remember a student coming to one of the officers in charge and asking to be excused at 3.30. On being asked why he replied "I want to make a call in the city" "Why not four o'clock?" "It wouldn't be according to society rules." I believe students have been in the habit since of calling after eight in the evening and a good deal later. On behalf of the ex-officers, who are with myself proud of our period of connection with Guelph, I will speak first of my friend Mr. Brown, the large-hearted and little-handed Professor of Agriculture. Only last year I saw Prof. Brown in London, and I hear from him occasionally now. He uniformly speaks well of Guelph and those he has known. Then I want to just say that I hear from Prof. Shaw, whose only kindness to me now is that he writes very much shorter letters than he used to write, because he had a most ferocious proclivity for writing; and he had that most delightful quality in this vale of tears in that he could be perfectly happy in doing so. I myself never could get into that state. However, Prof. Shaw is doing excellent work in the State of Minnesota, and his writings are frequently quoted in the agricultural papers of the South. Then, there is Dr. Grenside. I always thought he knew a good thing when he saw it; the best judge of a good horse I ever met; and Dr. Mills says he was an ardent Conservative. You can draw any conclusion you like from Dr. Mills' statement. He is doing admirable work in the Northern States of the United States. Then, there is Mr. E. L. Hunt, who was resident master for long years, now the Rev. E. L Hunt. Last Christmas I got a copy of the Washington Post, one of the leading strong papers of the capital of the United States. It had a column or a column and a half reporting the sermons of the great men in Washington on Christmas Day. One third of the report was that of the Bishop in the Episcopal Cathedral, one-third was that of some other eminent divine, and one-third was devoted to my friend E. L. Hunt, who spoke in the Presbyterian Church, and his sermon was the best of the three. Then, there is my excellent and honored friend, Prof. James, who has graduated into a larger sphere of usefulness, and the Province of Ontario has to thank the judgment and ceaseless activity which Prof. James showed in this College and has displayed such a large measure of in Toronto. I was in Boston a few weeks ago, in that centre of culture and wealth, and Prof. James' address on Agricultural Education was said to be the best representation given at any meeting in their whole experience. He still maintains the excellent reputation he had long years ago of being a capable and powerful speaker. Then there is Prof. Panton. He is what he was; a man whose influence will linger long with many of us, and that for good only; a scientist of rare ability; a teacher with patience to teach in christian gentleness No higher tribute can be paid to any man, even in these days, from the throne of England, great, majestic, almost omnipotent. Do you think it is the might of the great navy, the strength of that courageous arm that never flinches, or the wealth of the coffers of London, or the learning of the halls of Cambridge, or the enterprise that whitens the seas with sails or darkens the air with smoke, which has made the throne of England what it is? No, surely not. This you can say, "Victoria, Queen, thy gentleness hath made thee great" And Prof. Panton's gentleness has made him great. Then I want to say of my friend Mr. McIntosh, I can trace back some of my growth to the admirable teaching and work of Mr. McIntosh with the agricultural students at the College at Guelph. Of myself I have nothing to say, except that I am an ex-officer. I think the training I got here fitted me for doing some work in a larger degree. I hope the students will go on prospering. I hope this College will go on pros-

pering, and that its ex-officers will, so far as they can, create public sentiment in its favor. I hope the students and ex-students will join with us in our desire for its continued progress and continued usefulness, grounded securely in the confidence and affection of the students of this institution, both ex and present, so that the whole body of students will conduct themselves that the College and all its officers shall be just as securely and deeply grounded in the affections of the people of Ontario, and then the College will reach its highest possibility.

THE ONTARIO AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM FOR A QUARTER OF A CENTURY.

Dr. Jas. Mills, President of the Ontario Agricultural College, Guelph.

To the Hon. Sir John Carling, of London, belongs the honor of having taken the first steps towards founding a School of Agriculture in the Province of Ontario; to him also is due the credit of having established the Dominion Experimental Farms at a later date.



Sir John Carling.
First Commissioner of Agriculture for Ontario. Original promoter of the Ontario Agricultural College.

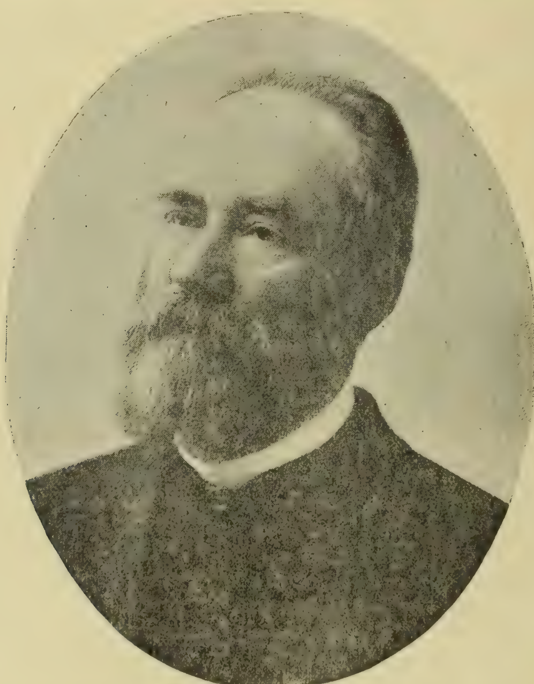
In his report for the year 1869, addressed to Governor Howland, Mr. Carling, then Commissioner of Agriculture and Arts for Ontario, spoke in complimentary terms of the system of general education in this Province, and then said: "I have a growing conviction that something more is required to give our education a more practical character, especially in reference to the agricultural and mechanical classes of the community, which comprise the great bulk of the population and constitute the principal means of our

Note.—This paper was prepared for the meeting of the Ontario Experimental Union and also for *The Farmers' Advocate*, in which it appeared December 1st, 1899.

wealth and prosperity. What now appears to be especially needed, in addition to the ordinary instruction in common schools, is the introduction of elementary instruction in what may be termed the foundation principles of agricultural and mechanical science, and I hope to be able, in the next report I may have the honor of presenting to Your Excellency, to record the fact of a commencement being made with a prospect of success."

Rev. W. F. Clarke, Commissioner.

On the 12th August, 1869, Mr. Carling appointed the Rev. W. F. Clarke, of Guelph, a Commissioner to visit the principal agricultural colleges of the United States, gain what information he could and report with the view of establishing in this Province a school to give instruction in agriculture and kindred subjects, and to conduct experiments for the purpose of solving some of the problems which confronted those who were engaged in agricultural and horticultural pursuits. Mr. Clarke's report, which appeared on the 8th



Rev. W. F. Clarke,
Commissioner who investigated other agricultural schools and colleges, and recommended plan.

June, 1870, was concise, comprehensive and scholarly, and withal practical and sensible in its suggestions and recommendations. It furnished the Minister with the desired information and indicated in outline the scope and character of a school of agriculture such as it was thought should be established in the Province of Ontario.

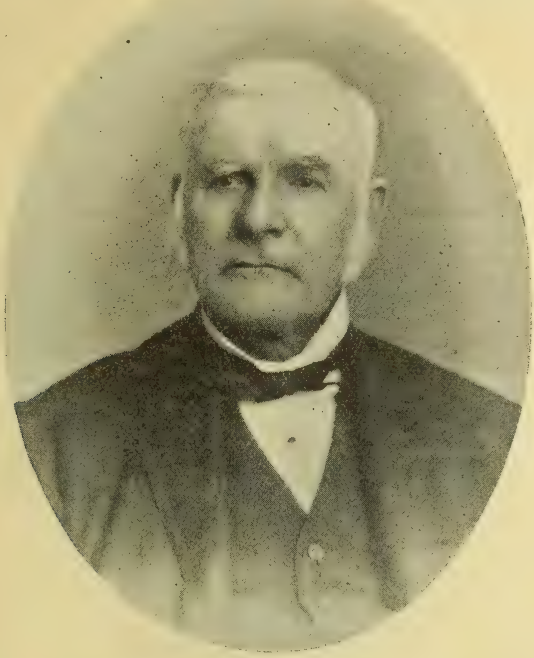
Schools of Agriculture and Practical Science.

So, in pursuance of his previous intimation, Mr. Carling, in his report for 1870, definitely proposed the establishment of two schools, one for agriculture and the other for mechanic arts, and the outcome of his recommendation and subsequent action was the founding of the School of Practical Science in Toronto, and the purchase of 600 acres of land for a School of Agriculture at Mimico, seven miles west of Toronto.

The land was purchased in 1871, and a contract for the erection of school buildings for the accommodation of 100 resident pupils, at a cost of $47,900, was entered into in November of that year; but, a change of Government having taken place that fall, the work was delayed for a time, and objections urged against the Mimico site by prominent farmers and stockmen caused some hesitation as to what should be done.

Hon. Archibald McKellar

At length the Hon. Archibald McKellar, the new Commissioner of Agriculture, requested the Provincial Board of Agriculture and Arts, and afterwards Professor Miles and Dr. Kedzie, of the Michigan Agricultural College, to examine the site and report as to its suitability for an experimental farm.



Hon. Archibald McKellar.
Second Commissioner of Agriculture for Ontario.

Both reports were unfavorable to the site, chiefly on account of the character of the soil and the lack of church and other privileges such as are enjoyed in the immediate neighborhood of a town or city; and the result was that a committee, consisting of John Dunlop, John Miller, John Dryden, the Hon. David Christie, and Robert N. Ball, was appointed to examine farms in the neighborhood of Whitby, Guelph, and Woodstock, with the view of getting a suitable site for the proposed school. This Committee reported the facts, without a definite recommendation, on the 13th of December, 1872, and left it for the Government to decide, which it did by purchasing the Guelph farm of 550 acres from F. W. Stone, a political opponent, in the early part of 1873.

Some additions were made as soon as possible to the farmhouse, which still constitutes the first two stories of the main building, in order to get ready for 30 pupils at as early a date as practicable.

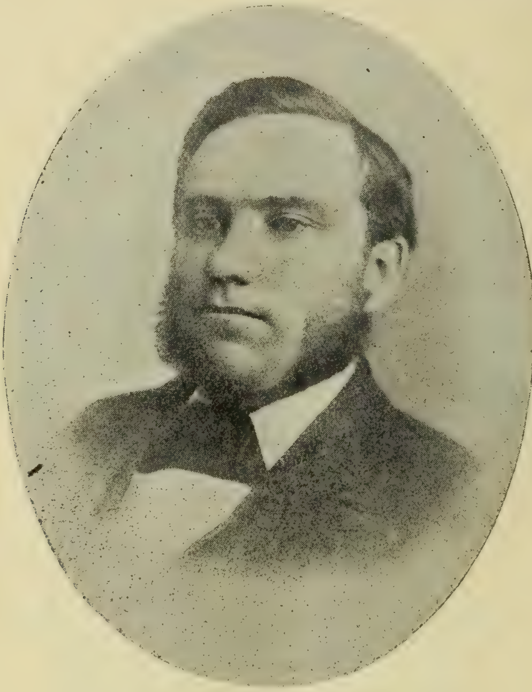
Name and Motto.—The name decided upon was the Ontario School of Agriculture and Experimental Farm, and the motto suggested by Geo. Buckland, the genial and scholarly Professor of Agriculture in the University of Toronto, was *Practice with Science.*

Liberal Terms.—In accordance with the recommendation of a Commission appointed to prepare by-laws and regulations for the school, the first years were to be regarded as a Preparatory Term, in which student help was to be largely employed to put the farm and horticultural department into shape for practical instruction at a later date. During this period students were to work seven hours a day in the outside departments, and for his labor in these departments each was to receive instruction, lodging, board and washing, with a bonus of $50 in cash at the end of the year, in

case he completed it satisfactorily and passed the prescribed examinations on the course of instruction.

Opening of the School in 1874.

On the 29th July, 1873, Henry McCandless, from Cornell University, was appointed the first Principal; and on the 26th of March, 1874, there appeared over the signature of Mr. McCandless a long advertisement announcing the opening of the school on the 1st May, 1874.



Wm. Johnston, B A.
Principal of the Ontario Agricultural College,
1876 to 1879.

List of Officers at Opening.

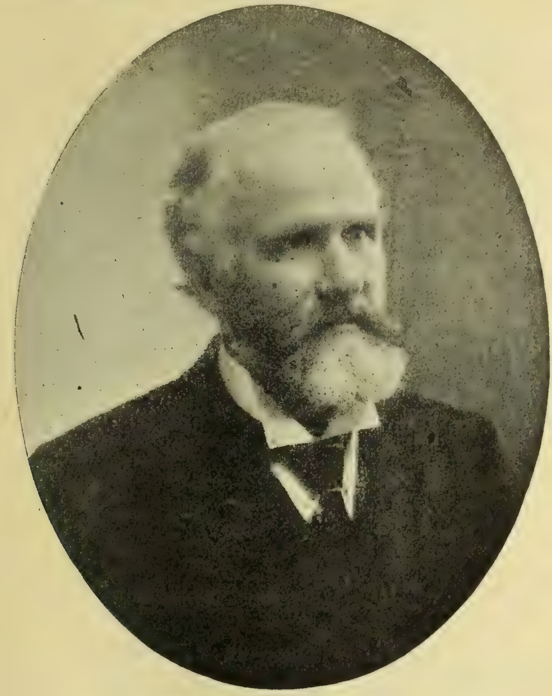
H. McCandless, from Cornell University	Principal.
Rev. W. F. Clarke, from Guelph	Rector.
James McNair, from Richmond Hill	Farm Foreman.
James Stirton, from Guelph	Stockman.
Thomas Farnham, from Toronto	Gardener.
James McIntosh, from Guelph	Foreman Carpenter.
Mrs. Petrie, from Guelph	Housekeeper.
T. Walton, from Toronto	Engineer.

Twenty-eight students entered the first term, and the outlook seemed encouraging, but the officers soon began to quarrel among themselves. In a short time the dispute between Principal McCandless and three or four members of his staff became so violent that Mr. Clark resigned on the 9th of June; and on the 13th of July, twenty-six of the students in attendance sent a petition to the Hon. Oliver Mowat, asking for the removal of the Principal. Mr. Candless resigned on the 18th of July, and the Government began to realize that its troubles had only begun.

The Second Principal.

Charles Roberts, Esq., of Haslemere, Surrey, England, a prominent graduate of Cirencester Agricultural College, was appointed io succeed Mr McCandless. He came out

for observation in the fall of 1874, but could not enter on his duties till April, 1875. In the meantime, Wm. Johnston, B.A., of Toronto, who had been appointed Rector, discharged the duties of Principal. According to agreement, Principal Roberts was on hand in April, 1875, but he was suddenly seized with an illness so severe that he decided to resign his position and return at once to his native land. Some have said that the illness was caused by the stories which were told him of the frightful difficulties, trials, and annoyances of the position which he had accepted.



JAMES MILLS, M.A., LL.D.
President of the Ontario Agricultural College,
1879 to the present time.

THIRD PRINCIPAL

Wm. Johnston, B.A., was employed in the capacity of Rector from August, 1874, till the end of 1875, and as Principal for nearly four years—from the beginning of 1876 till the 1st of October, 1879. Mr Johnston, though lacking in practical experience, was a man of real ability—a good organizer, an efficient executive officer and a vigorous writer. He soon grasped the situation, and to him very largely is due the credit of having placed the institution on a fairly solid foundation. He classified the work in the different departments, handled his men to advantage, an did much to give character and stability to the School.

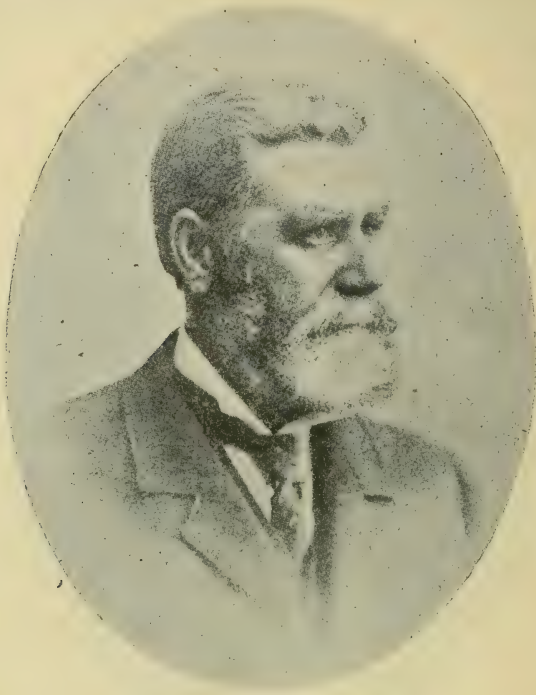
CHANGE OF NAME, ETC.

At the time of Mr. Johnston's resignation, and at his suggestion, the Ontario School of Agriculture and Experimental Farm became the Ontario Agricultural College and Experimental Farm, and the chief executive officer of the institution was afterwards to be known as President of the College. The writer took charge at that time (1st of October, 1879), and through storm and stress has stood by the ship for over 20 years.

FARM SUPERINTENDENTS.

From the outset, the office of Farm Superintendent was one of the most important in the School, and it is no less important in the College. James Laidlaw, afterwards representative of South Wellington in the Legislative Assembly, was Farm Superinten-

dent in 1875 ; William Brown, from the fall of 1875 till 1st of July, 1888, a period of nearly thirteen years ; Thomas Shaw, from the 1st of October 1888, till the summer of 1893—nearly five years ; and Wm. Rennie, from 1st October, 1893, till the 1st October 1899—exactly six years. G. E. Day, B.S.A., was appointed Superintendent on the 1st October of the present year (1899).



MR. JOHN I. HOBSON.
Chairman of Advisory Board of Ontario Agricultural College
and President of the Provincial Winter Show.

COMMISSIONERS AND MINISTERS OF AGRICULTURE.

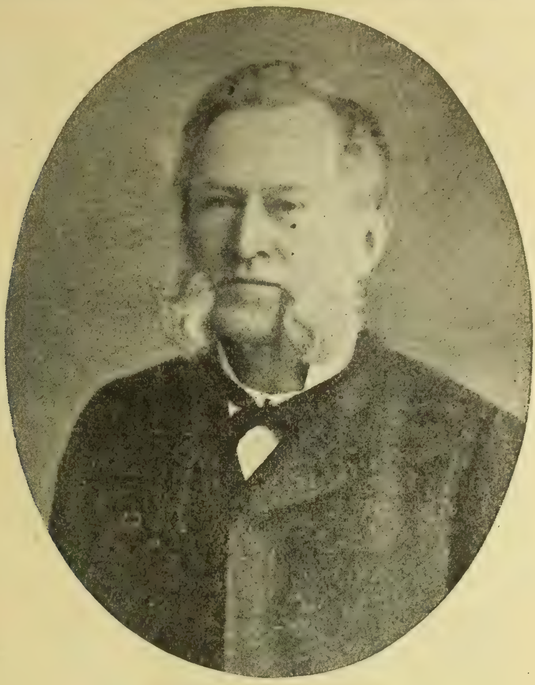
The gentlemen who, as Commissioners and Ministers of Agriculture, have had control of the School and College since the Mimico site was purchased by the Hon. John Carling are : the Hon. Archibald McKellar, about four years (1871 1875) ; Hon. S. C. Wood, nearly eight years (1875-1883) ; Hon. James Young a few months in 1883 ; Hon. A. M. Ross, about four and a half years (1883-1888) ; Hon. Chas. Drury, first Minister of Agriculture, nearly two and a half years (May 1st, 1888, to September 1st, 1890, and Hon. John Dryden, second Minister of Agriculture, over nine years from September 1st, 1890.

It would be invidious to enter into a discussion of the work done by the different Commissioners and Ministers ; but, without offence, we think it may be said that every one in the list devoted a great deal of time and anxious thought to the affairs of the College at Guelph, and did the work much better than it would have been done by any Board of Trustees or Governors.

ADVISORY BOARD

In the early days, (1874-75), there was an Honorary Council to consult with the President and the management of the school. This Council consisted of the Hon. David Christie, Hon. George Brown, Hon. Archibald McKellar, Professor George Buckland, James Young, M.P., Delos. W. Beadle, Esq , and James Laidlaw, Esq. The Council disappeared when the Hon. S. C. Wood became Commissioner of Agriculture, and the Commissioner alone controlled the institution, till the year 1885, when the Hon. A. M. Ross had an Advisory Board of practical farmers appointed to assist him from time to time, especially in matters pertaining to the management of the farm. This Board is

still in existence, and consists of John I. Hobson, Guelph, chairman ; C. C. James, Deputy Minister of Agriculture, secretary ; John McMillan, M.P., Constance, Huron Co.; William Donaldson, South Zorra, Oxford Co ; Edwards Jeffs, Bondhead, Simcoe Co ; G. B. Boyce, Norham, Northumberland Co.; and D. A. Dowling, Appleton, Carleton Co.



HON. S. C. WOOD.
Third Commissioner of Agriculture for Ontario.

STRONG AND WEAK POINTS.

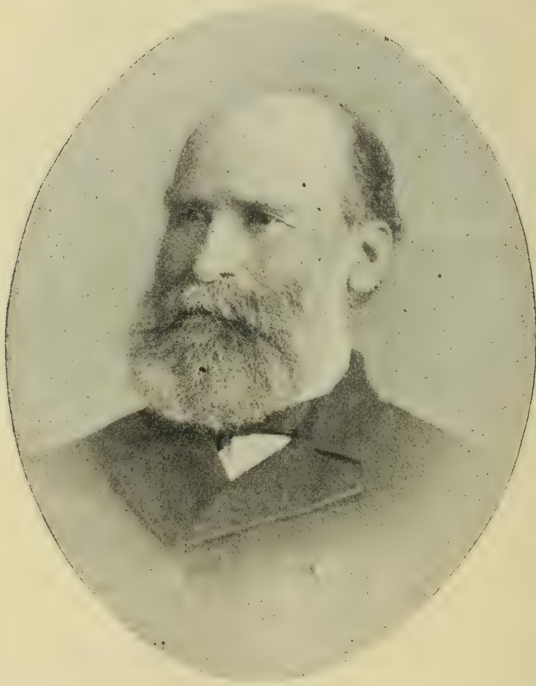
One of the specially strong points of the Institution, from '74 to '99, has been the thoroughly and persistently practical character of its work. Many United States Agricultural Colleges are *agricultural* only in name. They have placed agriculture in the background, and have broadened their courses so as to compete with arts colleges and universities. The Ontario Agricultural College has not done so, but has always insisted on manual labor, and has given special prominence to agriculture, live stock, dairying, horticulture, veterinary practice, and other branches of study which have a direct bearing on the ordinary work of the Canadian farmer. For a long period the Farm management was severely criticised by the farmers of the Province, and was often spoken of as the weak point of the Institution ; but, in time the tide began to turn, and during later years the Farm has been made an undoubted source of strength to the College.

One undoubted source of weakness, from the beginning till 1893 (for nineteen years), was divided, and necessarily conflicting, authority. It was a cause of trouble to the first Principal ; in the form of a double headship, it led to the resignation of Mr. Johnston, the third Principal, in 1879 ; in the same form it caused endless friction from '79 to '88 ; and in other forms it endangered the Institution at a later date. It was not till the summer of 1893 that the Government had the courage to give the President full control and make him responsible for everything, thus eliminating a serious element of weakness.

Another source of weakness has been the fact that throughout its history (commencing with the change of site) the College has been systematically and persistently discussed from the standpoint of Provincial party politics. In the discussion, the institution has very often been very much misrepresented and injured ; but by keeping free from politics and attending to its work it has at length established itself fairly well in public confidence and is beginning to receive a reasonable amount of sympathy and support from both political parties.

Courses of Study, Diplomas, and Degrees.

The primary aim of the College always has been to train young men for work and life on the farms of the Province. The course for an Associate diploma, extending over a period of two years, and including both study and practical work, has been arranged with this object in view; and nothing is allowed to interfere with this aim throughout the first two years of every regular student's course at the College. Those who complete this course and obtain the Associate diploma, signed by the Minister of Agriculture and President of the College, are known as "Associates of the College."



Hon. A. M. Ross.
Fifth Commissioner of Agriculture for Ontario.

In 1887, a third year was added to the course, and the College was affiliated with the University of Toronto for advanced examinations and degrees. The addition was made at the request of Associates who wished to pursue their studies in certain departments for a longer time than was embraced in the Associate course, with a view to preparing themselves more fully for the work of the farm or for positions as agricultural writers and teachers of agriculture, horticulture, dairying, animal husbandry, chemistry, biology or entomology. The work for this additional year is heavy, and none but the best Associates are allowed to take it. The examinations on the third year work are conducted by the University of Toronto, and the B.S.A. degree (Bachelor of the Science of Agriculture) is granted to the successful candidates at the annual commencement exercises of the University.

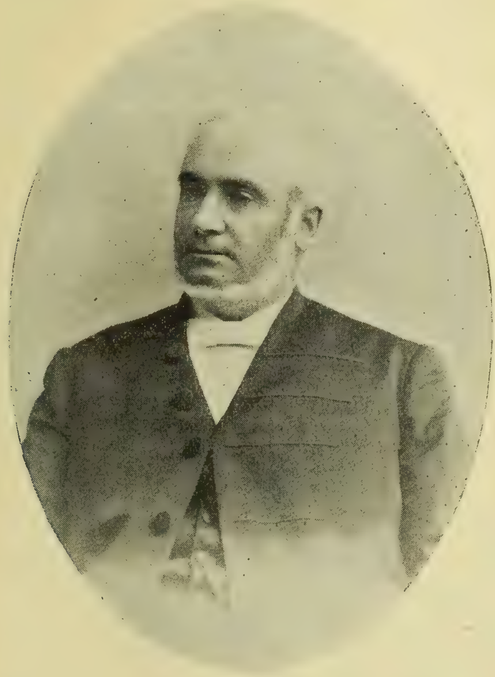
Ninety-eight degrees have been granted on the three-year course, and it has recently been decided to extend the course to four years—two years for the Associate diploma, and two additional years for the B.S.A. degree. This change is due to the fact that the additional work required for the degree has been found too heavy for one year.

A special course in dairying was announced for the first of February, 1893, and the attendance was so satisfactory that a new dairy building was at once erected, and the equipment for a permanent Dairy School promptly provided; so everything was ready for a large dairy class (over 100) in January, 1894. This school furnishes a very thorough course of theoretical and practical instruction in milk-testing, butter-making and

cheesemaking, and is divided into two departments—one for home dairy work and the other for a factory course including both butter and cheese. A special dairy certificate is given to those who complete this course.

Equipment Then and Now.

From the beginning, the institution had a very fair equipment for instruction in field agriculture and stock-raising—550 acres of land and substantial farm buildings, with good samples (male and female) of cattle, sheep and swine; three greenhouses and a large garden for instruction in horticulture, and two commodious classrooms for lectures and demonstrations on the subjects embraced in the course of study. A dairy building was erected in the early days, but little or no instruction in the subject was given for the first eleven years after the opening of the school.



Hon. Chas. Drury.
First Ontario Minister of Agriculture; now Sheriff of Simcoe County.

Houses for the Farm Superintendent, the Bursar, the Gardener, and the Farm Foreman were erected and large additions to the main building made in the Hon. S. C. Wood's time. New farm buildings were erected while the Hon. A. M. Ross was Commissioner, and the chemical laboratory (the first laboratory provided) was built and equipped in 1887, near the close of Mr. Ross' commissionership. The experimental barn was built while the Hon. Charles Drury was Minister of Agriculture; and the following large and important additions have been made during the *regime* of the Hon. John Dryden: New greenhouses, biological laboratory, convocation hall, dairy building (with complete equipment) and houses for the Department, poultry buildings and house for Manager, physical laboratory, experimental building, bacteriological laboratory, buildings for Experimental Feeding Department, and a new chemical laboratory (the first having been burnt.)

Present Attendance Overtaxes Capacity.

The number of students enrolled in the regular course this term is one hundred and sixty-four, thirty of whom are lodging outside for want of room in the College.

Present Position.

With an able staff of instructors and workers, and such large and valuable additions in the way of buildings, apparatus and appliances, it may be surely said that the College is now in a good position to train young men for agricultural pursuits; to do work in original research; to conduct experiments on various lines, and to lead the van of agricultural and horticultural progress throughout the Province.

Hon. John Dryden.
Minister of Agriculture for Ontario,
1890 to the present time.

The present equipment of the College may be briefly described as follows:

I.—For College Work.

A large and well furnished chemical building, containing a beautiful classroom and three commodious laboratories—one for first and second-year students in general, agricultural and animal chemistry; another for third-year students in quantitative work; and a third for special investigations and research in connection with the dairy and experimental departments.

A large and well assorted geological cabinet, especially arranged for purposes of instruction.

A well-equipped biological laboratory, with classroom and everything required for

theoretical and practical work in botany, zoology, and general biology, including cabinets and specimens for the study of entomology, or that branch of science which treats of insects.

A large and well-equipped bacteriological laboratory for instruction and original work in the vast and highly important field of bacteriological research.

A good physical laboratory, with tables and all necessary appliances for practical instruction in dynamics, mechanics, hydrostatics, hydrodynamics, electricity, and soil physics.

General and special lecture-rooms for studying, handling, and judging live stock, especially cattle, sheep and horses, and for practical demonstrations in the veterinary art.

A complete set of greenhouses, with lecture-room and laboratory for instruction in horticulture.

Lecture-room, with all modern appliances for the illustration of lectures on dairying.

A lecture-room for instruction in English and mathematics.

II.—For Practical Work Illustrative of Lectures in the College.

A farm of 345 acres of land in fine condition, well tilled and well managed.

A complete set of farm buildings and an ample outfit of agricultural implements.

Representative specimens of the most valuable breeds of cattle, sheep and swine.

A large experimental building, and 43 acres of land, divided into about 2,000 plots for testing varieties of grains, roots, potatoes and corn, and for experimenting as to different methods of cultivation, dates of seeding, kinds of seed, value of artificial fertilizers, etc.

Special stable, piggeries, and yards for experiments in feeding cattle, pigs and sheep.

A separate dairy stable and a special herd of 30 cows for experiments in dairying.

Butter, cheese, and milk-testing rooms, with the latest and best appliances for butter-making, cheese-making, and milk-testing, and the pasteurization of milk and cream.

Two rooms devoted to experimental cheese-making for nine months of the year, and to work in the dairy school for the remaining three months.

Large and well arranged poultry buildings, with 20 varieties of the most valuable hens, for practical instruction in the breeding, feeding, and management of poultry.

Sixty-three acres of land, including lawn, arboretum, forest-tree plantations, vegetable garden, vinery, small fruit garden, and orchards, for instruction and practical work in horticulture.

A carpenter shop, with benches and tools for plain work and general repairs.

Course of Study.

The course of study is liberal and very practical, specially adapted to the wants of young men who intend to be farmers. It embraces agriculture, arboriculture, live stock, dairying, poultry, bee-keeping, chemistry, geology, botany, zoology, entomology, bacteriology, horticulture, veterinary science, English literature and composition, arithmetic, mensuration, drawing, mechanics, electricity, bookkeeping, and political economy. French and German have recently been added for the B.S.A. degree. The purely practical or bread-and-butter subjects are well taught. The work in English is thorough, and the course in natural science is equal to that in our best arts colleges.

Outside Work.

Already the College has rendered excellent service to the Province at large by the publication of reports and bulletins from year to year, and in several outside departments of work :

(1) The Experimental Union of ex-students and others in testing manures and varieties of grain, grasses, roots, potatoes, and other crops throughout the Province—about 3,500 of them working under the direction of C. A. Zavitz, B.S.A., the College Experimentalist.

(2) The Farmers' Institutes, organized and controlled by the President of the College for ten years, and assisted by the College staff from their inception to the present time.

(3) Travelling Dairies, sent out from the College, controlled by the President, and conducted by graduates of the College.

(4) Dairy schools, east and west, under the control of the President.

(5) Fruit Experiment Stations, twelve of them and two sub-stations, testing varieties of fruit under various conditions of soil and climate throughout the Province, and preparing a description of Canadian fruits, under the control of a small Board, of which the President of the College is chairman, and the College Professor of Horticulture a member.

With due regard to modesty and professional etiquette, I think I may say that, through these organizations and in other ways, the College is imparting a great deal of useful information to the farmers of Ontario, is creating a widespread interest in agriculture, and is adding dignity to life and labor on the farm.

A Forward Movement Needed.

Progress has been the watchword of the College in the past, and it would seem that the time has come for another forward movement. Increased accommodation for students is very much needed, and there is a growing demand for instruction in domestic economy for farmers' daughters; so it would appear to be the duty of the Province to provide at once the new building which the ex-students asked for last year, and to add without further delay a large and well-equipped Department of Domestic Economy.

THE FUTURE OF THE ONTARIO AGRICULTURAL COLLEGE.

By Mr. C. C. James, Deputy Minister of Agriculture for Ontario and Ex-Chemist of the Ontario Agricultural College.

Mr. James referred particularly to two points in connection with the training of the students in the future. He thought that special instruction should be given in what might be called the study of "citizenship," so that when the students leave the College to become farmers they would at the same time be qualified at once to step into municipal life well equipped as to the duties and privileges of citizens. They should have an acquaintance with Canadian history, and be well grounded in municipal administration. They should be directed to take an intelligent interest in public questions, political, educational, and social. In the second place he thought more attention might with advantage be given to the special training of the students for Farmers' Institute work. Every student on leaving the College should have in his head and in his pocket at least two practical addresses or papers that he could give at Farmers' Institute meetings and defend against critics. These papers should be prepared under the direction of the staff and have been discussed before the students and staff. Many hints could be given to the students that would be exceedingly valuable in preparing for such work.

Beyond these two pieces of advice or suggestion he did not venture to prophesy. As the future, however, is largely the outcome of the past, he could only look for a most prosperous development of the institution, since after a varied experience the College has become so firmly established in the estimation of the class for which it was instituted.

ADDRESSES.

Hon. Chas. Drury, Ex-Minister of Agriculture for Ontario.

This is my third visit to the Agricultural College since the termination of my connection with it in 1890. It has not been that I have not been interested in the work done here. I may say that I have read carefully the various valuable reports and bulletins which have been issued by the College, and have been deeply interested in everything done during these years, and my failure to put in an appearance has not been because I have lost interest in the work but from causes beyone my control. I can truly say that it is a pleasure far me to be here to-night, and my deep earnestness with regard to this question is evinced by a fact which you will understand in a minute or two. I am glad, Sir, to meet you, the President of this Institution. I do not desire to say

flattering words, but desire to be just, and a word of praise from me may not be out of place. When I first become officially connected with the College my knowledge of the President was very limited. I may say that my interest in him grew with every day and every week and every month of my knowledge of his doings here. I found the Principal to be a safe man ; I found him to be a true economist. I do not pretend to say that I can look back with unmingled pleasure to my short official connection with this College. I, myself, passed through stormy scenes during the two or three years I was connected with the College. I had the misfortune to be connected with it during a time of great turmoil and anxiety. I congratulate you, Sir, that you have outlived all those things—that these dark and unpleasant things have passed away forever. My congratulation is that your rooms are more than filled, that you have the largest number of students enrolled that have ever been enrolled in the history of the College, and I believe it is true that never in the history of the College has there been such strong public sentiment backing up the work done at the College. I see carried out on these grounds improvements which I had in my mind but which, from causes to which I need not now refer, I was not permitted to be the instrument in carrying out. I am glad that my worthy successor has been liberal in his expenditure and has been progressive in his ideas, and when I stand as I do and look at the vast improvements which have taken place, I feel that great praise should be given for his progressive ideas and the work done under him. What shall I say of the College ? I have but one only son. I am glad to say that since he was a small boy I have drilled into him that farming was the best occupation under the heavens, and I am glad to say that he is in ardent love with the farm. Then, Sir, the fact that he is here is the highest compliment I can pay you of the useful work which is being done here. I know personally that the students of this College, the Associates and those who have taken the University degree, are exerting beneficial influence over the agricultural interests of the country ; that the ex-students of this College are represented by three of the noble contingent of the first thousand who went from Canada to South Africa. So that, Sir, you may take to yourself praise, some of it at all events, that while you strove to teach the boys the secret of successful farming, you did not neglect to implant in their minds love of country and that noble Empire of which we form a part, otherwise we would not have found that three of the College would have had a desire to serve that Empire by enlisting as soldiers. You have not only implanted in their minds the desire to excel in agriculture, but we will give you the praise of having filled them with love of country. I trust the country will be willing to increase the expenditure for agricultural education. I trust the time is not far distant when this question of assisting the College liberally, or its management, will cease to be a matter of political discussion, when all parties will rally in support of it, believing that we have the best interests of the country at heart. I wish you, Sir, long life in your present position, and trust you may enjoy growing prosperity in the noble work to which you have devoted your life.

John I. Hobson, Chairman of the Advisory Board of the Ontario Agricultural College.

I think my first duty is to thank the officers of this institution, or those who have had to do in the getting up of this re-union, for their courtesy and kindness in giving me an opportunity to be present with you to-night. I would congratulate you, Mr. Chairman, and those associated with you in the work of this college, in the splendid gathering you have, indicating as it does the large and wide interest which is being taken in this educational work. When my friend here, Mr. Monteith, opened out with the remark that he had forgotten or mislaid his notes, it brought to my mind an occasion when Sir Richard Webster, the famous English lawyer, was invited to a luncheon in Toronto. He was invited by telegram on the train between Kingston and Toronto. He commenced his remarks by saying he was very sorry he had not had a longer time—if he had only had a few hours to spare, he could have prepared one of those nice little impromptu speeches which take so well on an occasion of that sort. I thought Mr. Monteith's was a case in point, and I am not sure if it might not sometimes be a good thing if speakers did occasionally lose their notes. I will just refer to what one or two of the other speakers dealt with. Prof. Robertson referred to the valuable work done in this Institution, and he compared

the work done here with that done in other colleges in other countries. I may say that I can fully bear out, as far as my knowledge goes, and it is somewhat extended, every word which the Professor has said, and I believe it is not saying too much to say that this college has a world wide celebrity for the excellence of its teaching of the science and practice of agriculture. I think it can be borne out by men who know more vastly than I do that there is not in the world to-day a college during purely agricultural work which is the equal of the Ontario Agricultural College. You may say it is all talk, but I may tell you here that some two years ago, when I was in Edinboro, there was a meeting of the Agricultural Section of the Scotch Chamber of Commerce. I was invited to join them, and it happened then that the subject which was up for discussion was the desirability and wisdom of asking the Imperial Government to set apart a large sum of money for the purpose of building, equipping and carrying out of an institution similar to this. But what pleased me as a Canadian was this, that some of the most noted agriculturists of Great Britain, such men as James Biggar of Dalbeattie, and others, rose up man after man and spoke of the work done here. These gentlemen had visited this college and knew what they were talking about. Prof. James spoke of the very small number of boys attending college compared with the 300,000 sons of farmers in the Province. I do not know that that is exactly the right way to measure the influence which is permeating through the whole country as the good result of the education acquired here. I know this, as a judge of prize farms for a good many years I soon realized that there is no more powerful factor for good or ill than simply the force of example. You drive through a village in this country; you see the nicely built church, the neat little school house and well kept sidewalks. I soon learned that that was an index to the farmers around there. These young men go out from this college and are met with in the far off territories of the Northwest; you will meet them down in the Maritime Provinces; you will meet them all over this Province. We do not mean to say that every boy who goes to this college is a great success, they are not in any calling in life, but the large body of young men who go out from this institution are systematically trained, they have a larger knowledge than those who have not had such an opportunity, and have a great influence on those living around them. The influence from this college is probably much greater than we are aware of. Prof. James also spoke of the education which it was desirable our young men should have, an education which tends to good citizenship. I think we cannot place too much stress on that. I think it is a reproach on the farmers of this country that it is said of them, considering their relative number compared with those of other callings and considering the relative importance of agriculture, that there are too few of them who fill those positions of honor in the land, that they have too little to do with the councils of our country. We may depend upon it that it is a matter of the highest importance that the education of our young men should be more fully carried out. One word to this large number of bright looking young men sitting here to-night. Young men, do not make the grievious mistake of thinking your education is finished when you leave here. The real education of life is that which is acquired after you leave the school-room. A few weeks ago when I was in Toronto I attended one of the leading churches in the city, and the minister made this remark during the course of his sermon. He said that the future of a boy might be figured upon if you only knew how he spent the few hours after he quit work in the evening until bedtime.

Mr. James McIntosh, who had been at the College since it was first started, received a warm reception from the "Old Boys" as he took the platform. Mr. McIntosh made a very pleasing address, relating many college reminiscences which were greatly appreciated by both ex-students and the present students.

G. C. Creelman, B.S.A., Superintendant of Farmers' Institutes for Ontario.

Mr. James suggested in his address the preparation of students here for after life, and particularly preparation for work in Farmers' Institute meetings. Last week, in one of our most important districts, namely, East Northumberland, we had one of our afternoon meetings presided over by one of the graduates of this Institution, Mr. Bates, of Brighton; and the one who acted as secretary was another, and the programme consisted of an address by Mr Rennie and an address by Miss Maddock, a graduate of the Dairy School. In most of our Institutes we have on the staff as Directors

or Secretaries, or on the platforms, representatives of the body of graduates connected with this College. So that some work is being done in that direction. Unfortunately Mr. Rennie had a fainting spell, and I received a telegram from the meeting stating that another delegate had to be sent. I immediately telephoned to another ex-student to step in and fill the breach. And I had a telegram this morning to say that they had a rousing good meeting. So you see that the ex-students are already taking their places on the platforms of the country and doing their work. I would nevertheless be pleased to have the suggestion of Mr. James carried out. I was going to say a word or two in reference to the past and present condition of the Ontario farmer. Fifteen or twenty years ago the graduates and students in those days had their attention called to the grain growing of the country. After we came down from those hard times the farmers began to think more seriously about the future of their boys, and so long as wheat was a dollar or more the boy knew he was going to get a new pair of long top boots for fall, and a good imitation of fur cap, and he was happy ; but when it came down to fifty cents a bushel he had to get out the old top boots, and have the heels straightened by the shoemaker, and wear the old cap. When grain got so cheap on the market the farmers turned their attention to feeding it on the farm. First, the cheese factories and creameries throughout the country became much more common, the people on the farm sent their products to the factory, and the result was that they had cash coming in every month of the year instead of in the fall only. Second, the poultryman began to give more attention to killing and dressing for the market, and to-day the quality of fowl on the market is not that of a few years ago at all. Where a few years ago the apples were only the best of the pickings, now those very apples, with the appliances we have for spraying and killing the worms, have been so improved that the average Canadian farmer's orchard will bring in anywhere from $50 to $500 a year for apples alone.

H. L Beckett, B.S.A., President Experimental Union, Hamilton, Ont.

I feel very much pleased indeed to be here to-night to speak to you as an ex-student of the College. The Experimental Union is something we look forward to during the year. Not the least attraction, perhaps, we find here, is the annual supper. You know the old saying that the way to a man's heart is through his stomach, and I think Mrs. Craig has found that out. To the present students I would say make the most of the opportunities you have here. I am afraid in a great many cases the students fail to realize the opportunities they have at the present time. We have heard grand words of praise from the officers of the Institution, and I think that in a great many cases the students could make better use of their opportunities here. It is only after we leave these halls that we realize a great deal of time was wasted, and I would like to impress upon the students who are here now to try and make the best of their opportunities while they are here. In speaking of the students as a body I may say that when I entered the College in 1890, I was agreeably surprised at the high character of the students of that year. I was through the College to the end of the first term, and I never heard a student use an oath in all that time. That, I think, is something that cannot be said of many colleges. In the three years I spent at this Agricultural College I never saw a quarrel, I never saw a fight, and that I think shows that the moral influence of the College has been very great for good. I think the students that go out from the College are greatly improved in their morals, and I think that in a great many ways besides educational advantages they are benefitted. One of the best advertisements the College has at the present time is the ex-students, and as long as they represent the College to advantage, as long as they have a warm place in their hearts for the College and try to spread its praise, then I think so long will the College flourish. I am pleased to say that many of the ex-students whom I know have very warm recollections of the College, and they look forward from year to year to the Annual Meeting, and it has got to be something very serious indeed which will keep a great many of them from coming here.

Prof. G. E. Day, Ontario Agricultural College, Guelph.

It seems to me that very little has been said with regard to our Experimental Union, and I would like to say just a word or two in that connection. We all know that large

sums of money have been granted in past years to the interests of agriculture, and we hope that in the future the grants may be increased. As to the method of applying those grants, of course, there may be room for discussion and difference of opinion, but it seems to me that all of us will agree that whatever money has been expended on our Experimental Union has been well spent. I can speak freely concerning the Union because, though I am proud to be called a member, yet, owing to my position, I am not really able to be an active worker, and so what I may have to say does not apply to my own effort along that line. There is a danger in connection with public grants, and we find in many cases there seems to be a tendency, when a difficulty arises, instead of the people themselves making an effort to overcome it, to appeal to the Government, while those who are most interested sit idly by and do nothing to help along the projected work. Now, that does not apply to our Experimental Union; and, by the way, it seems to me we will have to change the name of our Union, because the name we have may be misleading. It certainly is not an "experimental" Union any longer; it is established beyond the shadow of a doubt. One of the main reasons why our Union has attained to the degree of success which it has is owing to the fact that it is founded upon sound principles; it is founded upon the principle of co-operation. There is co-operation between the members of the Union, and there is co-operation between the Union as a whole and the Government, and as a result we have a strong combination for effective work. I am sure you will all join with me in wishing our Experimental Union the highest possible degree of success.

As I am the last member of the College staff to speak, I should, perhaps, be lacking in duty if I failed to express our gratitude to the gentlemen who have spoken so kindly of the work we are attempting to do in the College; we appreciate very highly the kind treatment we have always been accorded by the members of the Experimental Union.

A WORTHY INSTITUTION.

The following editorial appears in *The Farmers' Advocate* of December 1st, 1899, accompanying the article by Dr. Mills that appears in this Report on pages 63-74:

It affords *The Farmers' Advocate* genuine satisfaction to give in this issue a résumé of the past and present of the Ontario Agricultural College at the Royal City of Guelph; satisfaction, because it is an institution upon which the farmers, not only of this Province but of all Canada, can look as a credit to the great industry which it exists to serve. Its progress through the quarter-century past, and its condition to-day, must be a source o fgratification to all who have had to do with its inception and its development. Education, investigation, and demonstration are its three-fold purpose. In common with many other like enterprises, it has had to face positive opposition and some criticism that was probably not always unwarranted; men have been skeptical of its utility, and others have regarded it with a species of negative indifference not infrequently the fate of state-aided concerns. These obstacles have in a large measure been overcome, and it is to-day the center of an ever-widening influence for good. The progress of the institution has not been of the pyrotechnic sort, but, corresponding with nearly all advancement that is of any real or permanent value, has been patiently, though steadily, made like the growth of an oak. Consequently, the secure and honorable position which it now holds is all the greater credit to its promoters and staff. Does the reader ask for proof of the foregoing statements? We point to the college now thronged to overflowing with students, the brightest of young men from Canadian farms; to the results of experimental work that commend themselves to the practical men and other investigators of standing throughout the continent; to graduates chosen for important positions in similar institutions; and to a farm proper that is clean, creditable, and growing luxuriant crops, the result of a system of tillage that seems well adapted to the soil there, and by the application of manures produced on the farm.

But what of its future? Has the institution attained perfection? Has it reached the limit of its usefulness? We trow not. Agriculture is of sheer necessity progressive, because the conditions that confront the farmer are subject to change; hence, its scope

and equipment must be enlarged and enhanced. We have, therefore, no hesitation in saying to the newly-reorganized Government of Ontario and to the legislators of the Province generally that any cheese-paring policy toward the O. A. C. will not commend itself to those who have the well-being of agriculture at heart—in other words, to the men who lead the van. Indeed, we look forward to the time when Canada will sustain not one only, but half a dozen agricultural colleges or schools.

We would encourage farmers instead of sending their sons to the Collegiate Institute and High School, say, after passing the entrance examination, to give them a good course of two years at least at the Agricultural College. Why? In the first place, the cost would be less—though that is a comparatively trifling matter—for all students have an opportunity by working on the farm to earn a portion at least of their board, and that occupation is most healthful and strengthening. Natural science occupying so large a proportion of the O. A. C. course, supplements the lack of it which is the weakness of the Ontario public-school curriculum. This will accord with the more modern view of the superiority of science-teaching as against the old classical system of education. With the former the student learns to know and *to do* by *doing*, training his faculties by a study of the things and the processes with which in actual life-work he has to deal. By increasing a love for nature it will check the tendency to leave the farm, to which, as the records actually show, the great bulk of the Agricultural College students return. The associations at the O. A. C. are such as to create greater respect for agriculture, and, other things being equal, should make those who take a course there more successful farmers. But the supreme function of education is not merely to impart information nor to train the student how to do things so as to succeed in acquiring wealth on the farm, but, above all, to develop manhood.

"Ill fares the land to hastening ills a prey
"Where wealth accumulates and men decay."

Herein lies the paramount importance of maintaining and liberally sustaining a college staff of high character and qualification, infused with the true genius and spirit of education. Coming under such influences for a fairly complete term, the young man will receive an inspiration which he does not get at the ordinary school, and the great body of students acquire, as we believe they do at Guelph, a morale or an *esprit de corps* which, coupled with the other advantages of the institution, must prove to them of incalculable benefit in the battle of life.

ANNUAL REPORTS

OF THE

CHEESE AND BUTTER ASSOCIATIONS

OF THE

PROVINCE OF ONTARIO.

1899

WITH AN APPENDIX GIVING THE REPORTS OF THE DAIRY SCHOOLS OF ONTARIO.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.)

PRINTED BY ORDER OF

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1900.

By Secs. 5 and 6 of Chap. 17 of the Ontario Statutes for 1900, the names of the two Associations known as The Cheese and Butter Associations of Ontario are changed to, and will hereafter be known as, *The Dairymen's Association of Eastern Ontario* and *The Dairymen's Association of Western Ontario.*

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MAKING WHITEWASH.

At dairy conventions and meetings the necessity of *perfect cleanliness* and the advantage of an *attractive appearance, inside and outside,* at cheese factories and creameries are constantly reiterated. The following recipe for making whitewash is highly recommended:

Take half a bushel of unslacked lime. Slake it with boiling water. Cover during the process to keep in steam. Strain the liquid through a fine seive or strainer. Then add to it a peck of salt previously dissolved in warm water; three pounds of ground rice boiled to a thin paste and stirred in while hot; half a pound of Spanish whiting, and one pound of clean glue, previously dissolved by soaking in cold water, and then by hanging over a slow fire in a small pot hung in a larger one filled with water. Add five gallons of hot water to the mixture, stir well, and let it stand a few days covered from dirt. It should be applied hot, for which purpose it can be kept in a kettle or portable furnace.

A pint of this whitewash mixture, if properly applied, will cover one square yard. It is almost as serviceable as paint for wood, brick, or stone; and is much cheaper than the cheapest paint.

Coloring matter may be added as desired. For cream color add yellow ochre; for pearl or lead color add lampblack or ivory black; for fawn color add proportionately four pounds of umber to one pound of Indian red and one pound of common lampblack; for common stone color add proportionately four pounds of raw umber to two pounds lampblack.

Cheesemakers might use a barrel and steam, instead of a furnace. The east end of the President's house at Washington is embellished by this brilliant whitewash. It is used by the government to whitewash lighthouses.

CHEESE AND BUTTER ASSOCIATION OF EASTERN ONTARIO.

ANNUAL MEETING.

The Cheese and Butter Association of Eastern Ontario held its twenty-third annual meeting in the village of Madoc on the 10th, 11th and 12th January, 1900. The Reeve and Council of Madoc, assisted by a vigorous Citizens' Committee headed by Mr. A. F. Wood, ex-M.P.P., were active in welcoming the Association, and every effort was put forth by them to make the gathering the undoubted success it was. The meetings were held in the Opera House and were well attended, as many as seven or eight hundred persons being crowded into the evening assemblies. The place was decorated by numerous flags and mottoes. The complimentary banquet on the evening of the second day's proceedings was well planned, and proved to be a delightful time for both the guests and the citizens who acted as hosts.

THE PRESIDENT'S ADDRESS.

By D. Derbyshire, Brockville.

The very pleasant duty devolves upon me this morning to open this the twenty-third annual convention of the Butter and Cheese Association of Eastern Ontario, in the town of Madoc. We have been greatly pleased with our reception to-day, and particularly so, on account of the business-like way your leading citizens of both town and country have assisted us in the arrangements for holding this convention here, for which we thank you most heartily.

I have no doubt you feel proud of being the centre of immense mining interests—gold, copper, iron, etc., being found in abundance in this vicinity, and you have only touched the fringe in its development. Yet, I want to draw your attention to-day to your leading industry in this section and throughout this Empire Province, and capable of great improvement; I mean the dairy industry. We all feel proud of the great advancement we have made in the past; still, we are looking forward to greater extension and vastly improved goods after this convention, on account of the practical men of high standing whom you will have the pleasure of hearing before we leave you.

Another year has passed into history, the best we have ever had, and I am proud of the very excellent work this Association has accomplished. With our selected staff of instructors visiting as they have all our butter and cheese factories, giving exactly the right information at the proper time, and enabling our makers to turn out a finer article of both butter and cheese than ever in our history, we certainly have done more and better work in 1899 than in any year before.

Cheaper Production.—Probably the greatest problem before us at the present time is cheaper production, and if our patrons are to make money this problem must be studied. Manufacturers and all business men are studying this subject most earnestly, and our dairymen must. If we could only get our patrons to do as well as two or three of the best patrons sending milk to each factory in our country are doing, it would add millions of dollars to our dairymen. Or if we could by any way get our patrons to grade up all their cows to give as much milk as one or two of the best they now have, what an advancement it would make! It is all-important that we increase the quantity of milk furnished to each factory in our whole country, and improve the quality as well. I believe the patrons should be brought together at least once a month, have a large blackboard, with each patron's name on it, and put opposite each name the quantity and quality of milk furnished by each, how each herd was fed, etc., and have the matter discussed fully; and I think you would soon see that you patrons will go to work as they never did before. Discuss cheaper production — improving the stables, building silos, and every matter pertaining to the business, and you will be rewarded. We must get at the man who makes the milk, and encourage him, and you will see 1900 the greatest season in the history of our dairy business in this Province.

Our Creamery Butter.—We are making rapid strides in our creamery business, and beginning to take our proper place among the best butter producers in the world. We exported in 1899, from the 1st of May till the 1st of November, 451,050 packages, which is 171,000 more than we exported in the same period in 1898, and received therefor $2,500,000 more money, showing that we not only made a very large quantity more than any previous year, but we made a finer quality, that brought us this vast sum more. This is very gratifying indeed, and I ask all your hearty co-operation in perfecting and extending this very important part of our work, which we can safely do.

Our Cheese.—Our cheese has attained such a high standing that very little requires to be said. Our shipments were about the same in 1899 as in 1898, but our quality was greatly improved, and the market good, so we received $2,000,000 more money for cheese than in 1898, which makes $4,500,000 more for butter and cheese than the previous year, showing 1899 the banner year for our great dairy industry. If we can only get all our butter and cheese factories improved, so that we can control the temperature, and turn out an even quality of fancy goods, having all our makers that expect to stay in the business, become thoroughly competent, you will be surprised at the extension we can make, and the prices we can get for our goods. The day for selling ordinary butter and cheese is past. Everybody wants fancy goods, and it is our business to see that we have exactly what our friends want. Let us unitedly say to-day that we shall put our factories, and especially our curing rooms, in first-class condition, and have our makers attend one of the excellent dairy schools, so generously provided by our Government, and be in a position for making a decided advancement in the quality of all our goods in 1900.

Transportation.—The Hon. Sydney Fisher, has looked after the transportation well during the past season, and our butter was placed on the British market in fine condition. Still we would urge him not to relax any, as our quality will be improved and the quantity will be largely increased this coming season. We want some arrangements with our railways for an improved service in connection with our cheese. In the hot weather we should have ventilated cars, so our cheese would reach the market in fine condition. This Association will take this matter up with our leading railways, so as to insure an improved service, and we ask the co-operation of everyone to assist us to obtain this very desirable end. The Hon. Sydney Fisher, Prof. Robertson, Hon. John Dryden, and President Mills have heartily given their assistance and co-operation, for which we all feel thankful. Our instructors have been all that could be desired. The members of our Board have worked harmoniously together, so that the year just closed has truly been a happy and prosperous one for all our dairymen. I am glad to be able to testify that all our butter and cheese men in Eastern Ontario are united and giving each other every encouragement. This convention opens up a new year for us. When we leave Madoc four our several homes, let us be inspired with one idea, and let that be "Improvement" all along the line, better feed and a larger supply, better cows and keeping no poor ones; better stables, properly ventilated; better factories, warm, well drained, and plenty of pure water; better makers; and, above all, cleanliness in all departments, from the milking of the cows to the packing of the butter and boxing of the cheese, and we will all have the great pleasure at our next convention of rejoicing together, that 1900 was truly the greatest year in the history of our Association.

Once more let me thank the business men of Madoc and vicinity for your royal reception to-day, and for the generous way you have assisted our Secretary, Mr. Murphy, in making arrangements for this meeting, and I feel sure that you will all be satisfied that our meeting with you has been a great success in advancing our great national industry. We extend a hearty New Year's greeting to sister associations, and trust they will all have a successful season.

COMMITTEES.

The following committees were then appointed:
Business: The Reeve (Mr. J. O. Dale) of Madoc, A. T. Wood and R. G. Murphy.
Nominations: Jas. Whitton, J. R. Dargavel and Wm. Eager.
Finance: T. B. Carlaw, John McTavish and Edward Kidd.
Legislation: Wm. Eager, Henry Wade and R. G. Murphy.

WELCOMED BY THE REEVE.

Mr. J. C. Dale, Reeve of the village, was introduced, and as head of the municipality addressed some cordial words of welcome to the Association. He assured the members that every business man and every professional man in the place was pleased to have the gathering meet in Madoc, and he knew by the large attendance of farmers of the section, that they, too, were glad to have leading dairymen come and talk about the great industry. Much of the prosperity that Madoc district enjoyed to-day, rich though it was in mineral deposits, was on account of the great development of the dairy business. He remembered when the first cheese factory was built in the township of Madoc. Up to that time the farmers of the neighborhood had depended almost entirely upon grain; but he could see that the prosperity of the section in an agricultural sense had dated from the beginning of that cheese factory. He could also remember when the people at the front used to refer to Madoc township as a bare and unproductive place, but he doubted if there was a more prosperous township in the Province to-day, thanks to dairying. Financial gentlemen had informed him that there was no township in Ontario that met its interest account better than did Madoc, and the cow was the chief factor in winning that good reputation. The value of land in the township was as high as in any part of the Province. The dairy industry has done a great deal for the village and the adjoining section, and it was therefore not surprising that he and his colleagues rejoiced to welcome so representative a body as the Cheese and Butter Association of Eastern Ontario.

Mr. A. F. Wood, ex-M.P.P., also added his greetings to that of the Reeve, and referred to the great advance made in the Madoc district since the cheese factories had been started.

The President, after thanking the gentlemen who had spoken for their welcome, called upon some of the leading dairymen present to make brief impromptu addresses.

Mr. J. R. Dargavel spoke of the work which had been done and was being done by the Association to further the dairy interests of the country, and as one proof of the success which had crowned its efforts he pointed to the difference in price which the dairymen of Ontario were receiving in comparison to that received by the dairymen of the adjoining State of New York. This was largely owing to the high class of instruction given by the inspectors and instructors in the employ of the Association. He much regretted that the hands of the body were tied for want of sufficient funds. The grant from the Government was only about $3,000, although the Association was spending about $10,000, the difference being made up by the dairymen and manufacturers. He hoped that, in view of the splendid work being done by the Association in educating the farmers and improving the quality of the milk products of the Province, the Government would see its way clear to at least double the grant.

Mr. Edward Kidd, after thanking the people of Madoc and vicinity for their hearty welcome, said that some people asked what the Association was doing for the money it received from the Government. Mr. Dargavel had shown that the Association had spent over three times as much as it got from the Government, and that the effect of that expenditure had been to enhance the value of our cheese product compared with that of our neighbors immediately to the south. The instructors and inspectors were all paid by the Association, and in various ways the organization had the dairy gospel proclaimed all through the eastern part of the Province. As a result our great industry was now in a flourishing condition. Considerable of the income of the Association had come from fines from persons who had been tampering with their milk, and much as this was to be regretted it was necessary to do all that could be done to stamp out dishonesty among patrons. A fair amount of the revenue of the Association also came from sums paid in for instruction, and he trusted that more instruction and less prosecution would be the record for the future, although wrong-doers should always be brought to account. The Association deserved the most liberal support of the Government.

Mr. J. Aug. Hayes, who was introduced in a happy manner by the President as a Director of the Bedford District Dairymen's Association, of Quebec, said that although taken by surprise he had pleasure in speaking a few words on behalf of his Association, more especially as the gentleman who had introduced him was not only President of the Eastern Ontario Association, but was also a honorary member of the Bedford Association.

Mr. Hayes continued: The District of Bedford Dairymen's Association is working along the same lines you are, with the same grand object in view—the spreading of practical knowledge of methods in the producing and manufacturing of the products of the dairy in the form of butter and cheese, not only among the butter and cheese makers but among the dairy farmers themselves, in order that all along the line we will be in a position not only to maintain the reputation of the Dominion of Canada as the grandest dairy country on the face of the earth, but to still achieve greater success until our dairy products have established themselves in the markets of the Mother Country as the finest goods that can be made. This we have practically done in cheese, and I believe the future is very near when the same can be said of our butter, if we are only true to ourselves and keep this grand object in view. Realizing that this is the main object of our Associations, let us learn all we can from one another, and when we leave here and go home to our work let us do so with a still stronger determination than we ever had before to make this new year of 1900 the most successful dairy year in the history of our Dominion. We have done well in the past, let us do better in the future. And now let me say I feel sure that this Association is proud of the reception it has received from the citizens of this stirring little town, and I am sure that the people of Madoc will reap a benefit from your visit worthy of the efforts they have put forth in providing so nobly for your comforts.

DEVELOPMENT OF THE DAIRY HERD.

By J. H. Grisdale, B.Agr., Agriculturist Central Experimental Farm, Ottawa.

The development of the dairy herd is a most important point in the success of the butter and cheese industry. There was a time when the development of the herd was not thought to be of very great importance; but to-day our farmers are fully aware of the important part that dairying plays in agriculture, and the necessity of keeping their cows in the best possible working condition. The progressive dairyman now knows that he must have cattle of the very best character, that he must waste no feed, and that no animal must be kept that is merely eating off its head. We keep cattle for the purpose of earning money and making a profit. But how many dairymen are making a profit out of the business? Is it too much to say that fifty per cent. of those engaged in the industry do not make a profit out of it. It is only those who realize from $35 to $40 a year from each cow that are making anything out of the business. Too many men are feeding cows that do not pay for their keep, and no other industry could stand such a profitless kind of work.

Average common cows can be made to yield a profit. This has been done in a public manner out in Minnesota. Prof. Hæcker, of the Expeiiment Station of that State, bought up some common cows, and where he began with an average return of $27.50 a year, he managed to bring them up to $44.50 a year. In the states of Nebraska and New York practically the same thing has occurred. In the state of Connecticut some of the very best herds were experimented with, and the cost of milk production was reduced about six cents a hundred, and the cost of producing a pound of butter was lessened by two cents by improving the rations. Of course it would not do to say that feeding is everything. If we start in to feed a herd of cattle that are more or less unfit for producing an abundance of milk we are likely to do so at a loss. Fitness is requisite.

In selecting a dairy cow we must first consider her purpose. Why do we keep a dairy herd? Is it not for the purpose of sending good food and plenty of it—of milk, butter or cheese—into the market? The dairy cow is not only an animal, but she is a machine. And if we are to judge a machine we must consider the purpose for which that machine was intended, and its apparent fitness to meet the requirements of that purpose. The cow must grind up a certain quantity of food and turn it into milk. She must thus have capacity for a large amount of this food, and therefore should have a large barrel, long and deep; either of these characteristics, or both joined to good digestive powers. There must be a good sized mouth to fill this machine; if the mouth be small the cow cannot eat much, and therefore cannot produce much milk. The food is not at once turned into milk and taken directly into the udder. What the animals eats is first changed

into blood, and then into milk. The udder, however, is a most important organ, and should be large and well developed. A cow with a small udder will be only an average yielder of milk at the best, and the average cow is just the animal you should get rid of. In addition to a deep, large udder, the dairy cow should have large large milk veins. The venous or waste blood from the udder is carried off in the milk veins. A large udder and well developed milk veins are found together in a good type of a dairy cow. As I have already told you, the leading points of the best type of a dairy cow are a large abdomen, that is a long and deep barrel, a large mouth, and large and well developed milk veins and udder. All other things should be subsidiary to these four leading characteristics. The dairy cow should have a "wedge" shape. If you want a cow that will devote all her energy to turning food into milk get one that narrows from the hook points to the shoulder.

A good constitution is necessary in a dairy cow. There is nothing more draining upon the nervous energy and strength than the calls of maternity. There is no more severe strain upon an animal than the yielding of a plentiful supply of milk. The constitution is tried in this connection mainly in the lung and heart power. To be strong in these two respects means that the chest must be large and deep and slope up to the shoulder. I was never so strongly impressed with this point as I was when in London recently attending the Stock Show. You are all well aware of the recent dairy test there, and how that splendid cow Aaltje Posch 4th made a record as a producer of butter. This Holstein cow was not so strongly characterized by such marks as small head, fine bone, etc., but her heart and lung power appeared to be well developed. She was early picked a winner as to form, and she bore out that judgment. However, as far as possible there should be a general development of all these points. One or two may be lacking, or appear to be lacking, when these may be only concealed by the over-development of some of the others. Any cow that will lay on a great coating of fat outside is one that is not wanted for the dairy. The fat should be put into the milk as much as possible. The fat is worth more in the milk than it is on the cow's back.

The question of getting a good dairy cow, then, resolves itself into the three headings of selection, breeding and feeding. Let me briefly consider these in the order named. Choose your calves by the dairy form. It is very early indicated which calves may be expected to develop into a thoroughly good dairy cow. Once you have made a resolution to try and develop your dairy herd, stick to it. Your President said to-day that there are some animals earning only $14 a year, and the owners are spending from $25 to $30 on each of these animals in board and keep. This is a fact; remember it, and let it influence you. One great help to proper selection is to choose a sire that has been tried. Make sure that he has produced good stock before you try him on your herd. If you cannot get a tried sire, and must use a young animal, see that he is not too young. Young bulls bred to heifers mean small and inferior calves as a rule, and even with older cows a young sire is not desirable. The bull is generally speaking responsible for the form of his progeny, while the dam is more largely responsible for the internal qualities. This is a principle that has long been established. However, do not depend too much upon the form of the sire, important though that may be. The pedigree of the animal and the performance of his kin and himself must go with his appearance. See to it that his dam has been a good milker, and that his sire came from a good milking strain, and go as far back in his history as you can for milking qualities. Without these points being considered you have nothing but chance in selecting a sire. Always choose a pure-bred sire, because he is the result of generations of selection, and is therefore likely to be strongly prepotent. But there are culls among pure-breds as well as among grades, and a pure-bred cull is more to be condemned than a good grade. Many a man in making an endeavor to improve and grade up his herd, says, "I cannot afford to put much money into this thing at first, so I must get a cheap pure-bred animal." But if he gets a cheap, poor cull of a sire he is really going backward, and his herd will not improve but rather deteriorate. By all means get a good pure-bred bull from a reliable cow. Judge pure-bred stock both by form and performance.

Having now the cow and the sire, let us look at the raising of the young stock. It will not do to take every heifer calf and say, "This shall be our future cow." You must select for ancestry and form. Do not leave the little thing in the pasture, giving it a little hay-tea and other occasional attention, and think that you will see it develop into a

good dairy cow. It must be fed properly. We want in our dairy cattle flesh, muscle, and milk producing qualities. If we would have flesh, we must feed our animals flesh-forming material as protein. About seven or eight per cent. of milk is protein, and only about four or five per cent. is fat. This is indicative of the relative quantities of these materials which should be fed to a diary animal. Nature therefore tells us that this is about the right proportion for a dairy ration. If you are told by nature to feed certain kinds of food to a cow to produce milk, and you feed some other kind of a ration, do you think that nature will alter her laws and bend herself to meet your wishes? No, indeed. We must bend and bow to the rules which nature has laid down for us; and to obey her in this respect is to be wise and successful. The best time for a cow to come in is the fall or early winter. Our factory men are willing to start winter creameries, and these establishments properly conducted are the ones most likely to pay. The cows which come in the fall are the ones which will give the best milk record for the year. Too many farmers consider theirs an industry in which they should work for seven or eight months, and do little or nothing the rest of the time. But the better plan is not to work so hard in the summer, and not to take it so easy in the winter. Do not let the cows run down in the winter, feeding them a little corn stover and rye straw, but feed them decently all winter. A calf dropped in the fall will come through the winter in good shape if properly cared for, and will get a good start on the grass in the spring. See to it that heifer calves are fed wisely. Do not get them too fat. See that their ration is well balanced; that they get a fair proportion of food to develop fat; but see also that they get a good share of flesh producing material, or what are called albuminoids or protein. By feeding bulky foods in a proper way you can increase the size of the abdomen, which is that part of the machine which largely decides the quantity of milk a cow can give. For this reason roughage is a double benefit fed in an intelligent way; it enlarges the barrel and is cheap food. But the more condensed and valuable foods, such as meals, etc., are not to be neglected. Why do we feed bran? Simply because it contains a certain constituent which is important in building up the tissues. This is described as albuminoid, and is practically the same materially as is found in the white of an egg. If you will examine the curd from skim-milk you will find that is chiefly albumen. From this you can estimate the large amount of albuminoid or portein there should be fed te our dairy cows.

Selections does not mean breeding only, but also means feeding. Selection by feeding is one of the quickest ways to develop a dairy herd. There is not a herd of milking cows owned by any man here to-day that cannot be made better milkers by a little more thought being put into their feeding and care. And thoughtful feeding is nothing more or less than scientific feeding. We should feed, thinking of what we expect to get from the animal. There is now no reason for every dairyman not knowing the exact proportion and relation of the various constituents in a ration fed to his cows. I repeat that he has little or no excuse for not knowing what food is likely to make fat, and what is likely to make flesh and muscle, or milk. If he is in doubt as to the food value of certain rations, let him write to the Agricultural College, Guelph, or to me at the Central Experimental Farm, Ottawa, and we will send you a reply giving you its composition, and let you know what is thought of it in Canada and all over the world, for that matter. Do not lay too much stress on the size of your ration. You may have a large ration, and yet it may be a poor one because it is not properly balanced. I have known some dairymen to be feeding one of albuminoids to sixteen of carbohydrates, and then wonder why they did not succeed. If you do not give a milking cow enough protein she will keep all you give her to keep her going, and she will be merely sustaining herself and giving you no return. If a cow is expected to give forty or sixty pounds, as she should do, or twenty to thirty pounds, which she usually does, she must receive about two and a half pounds of protein, while as a rule there is only about a pound fed. This is an expensive item in feeding, but it pays. Do not let the word "protein" frighten you. It is that substance which gives feeding value to the oil cakes, to oats, meals, bran, etc. The Storrs Experiment Station, Connecticut, by giving proper direction to the farmers in that section, helped them to lessen the cost of producing milk six cents per hundred, and two cents a pound in the case of butter.

The best way to make money in dairying—in fact it is the only way—is by lessening the cost of producing the milk. As I said before, about fifty per cent. of the cows on

our farms do not pay for their maintenance. You must feed as nature dictates. If you look at the period when the cows usually do their best work you will find that it is in June. One reason is that they are then newly calved; the other reason is that they are on the new and succulent grass. In that early summer grass the proportion of protein carbohydrates is about one to five or six. We must try to continue like summer conditions in winter, and the nearest we can come to June pasture in winter is by feeding corn ensilage and roots with meal or bran. We must remember that without much water we cannot get a full flow of milk. Both roots and ensilage contain a large amount of water, and therefore help to make a ration succulent. Now as between roots and ensilage, it is admitted that the former may be somewhat nearer the balanced ration; but roots are more expensive than ensilage, and they are more difficult to handle and store. I think that both roots and ensilage are good, and they may be fed together. If you are feeding dry food, there is nothing better than well-cured clover hay; in fact there is nothing superior to clover hay, but it is too dear for a full ration. A ration that will be relished by a cow in winter can be prepared by putting a layer of clover hay (cut preferred) first; then a layer of roots or ensilage, and so on. Put a little water upon it, and leave it there until next day. You will then have a mess that will rival June grass. The cow will eat a great deal of it, will relish it, and will turn it into a relatively large amount of rich milk. Feed freely. Feed in summer; feed in winter; feed when heifers; feed when cows; feed when dry; feed when giving milk. Feed! Feed!! Feed!!!.

Mr. Kidd: Do you believe in feeding twice a day, or three times?

Mr. Grisdale: I believe in feeding three times. It is an extra amount of work for her to eat in the morning and then be idle all the day, only to work like a slave when she eats again in the evening. I would rather feed her three times a day, and I let her work at an easy gait all the time. I think a study of the general laws of the animal will go to support my theory. Overfeeding of any animal is likely to be injurious. If you ate only one meal a day, and a heavy one at that, it is not likely to do as much good as the three ordinary meals a day. One or two meals is likely to too largely strain the stomach.

Mr. Kidd: Do you believe in letting the cattle out for exercise in the winter?

Mr. Grisdale: I believe in keeping them in on cold days, but under certain conditions it would be well for the animals to take exercise in a well-covered or well-sheltered yard, where they may come in or go out as they like. Prof. Jordan, of New York State, has tried this, and he found an increase of ten or fifteen per cent. compared with animals exposed all day, and they also did better than the animals that were kept in all day. Those kept in, however, did better than those exposed all the day.

Mr. James Caskey: Do you think a cow gets sufficient exercise from the mere digestion of her food?

Mr. Grisdale: No. If you develop only one arm or muscle you are not developing the whole body.

Mr. Caskey: Do you believe in the principle of close housing of dairy stock in winter?

Mr. Grisdade: I do not. That is, not in keeping them in absolute confinement all the time.

Mr. Caskey: At our Farmers' Institute, Mr. Woodward said that successful dairymen must have the following three requisites for their stock: close housing in winter, constant watering, and high feeding.

Mr. Derbyshire: What do you think yourself?

Mr. Caskey: I do not think that my method is perfect, as I have not water constantly in my stable. If I had everything as I would wish I would let the cows out on fine days, but shut them up during the inclement weather.

Mr. Grisdale: I quite agree with the position just taken by Mr. Caskey.

Mr. Newman: Can you give us a good device for a watering trough for winter stabling?

Mr. Grisdale: This is a difficult problem to settle. At the Central Experimental Farm they abandoned the old method of watering in a trough, because it was thought that that might have had something to do with the spread of tuberculosis. I have visited some of the best dairy farms in Ontario and Quebec, and have noted the plans for watering stock. I have found the Buckley and Woodward devices to have been

adopted by several leading stockmen. The Buckley device has a long pipe extending from one row of cattle to the other, and at intervals between every two cows the pipe comes up to a small trough which gives in some cases just enough for one cow and sometimes sufficient for two. The water can go up into the trough, but it cannot go back again. The water comes from a large tank, and it is controlled by an automatic valve which keeps the water to a level. As the water is drank by the cow more comes in, and the water is kept up to the level. One drawback to this device is that the ensilage and hay gets into the trough, and it has to be cleaned out frequently.

A MEMBER: I know where the trough has a lid on, and the cows learn to lift the lid when they desire to drink. It is a home-made device.

Mr. HONEY: I have seen something similar. The cover projects over the front, and is hinged on the back, and when the cow wants to drink she lifts up the cover and drinks, and when she withdraws her head the cover or lid falls down again. With these troughs, however, a cow may be eating chop or ensilage and some may get into it, and the warm breath of the animal would likely make it sour. Some think that warm stables are the cause of tuberculosis and other diseases, but I think that dirt is the most prolific cause of disease. Which would you prefer—to let a cow remain in a stable without exercise, or let her exercise in the barn yard when the thermometer is below zero, as it often is?

Mr. GRISDALE: Let her out for a few minutes or for half an hour in ordinary weather in winter; that is, if she wants to.

Mr. KIDD: Most of the dairymen around Ottawa leave their cows out for from two to four hours a day when it is not too cold.

Mr. DARGAVEL: I never saw a cow go out just for "exercise." I think you will find that if a cow is turned out of a comfortable stable she is more likely to wait around for the stable door to be open again. A herd put out on a winter's day will not average more than a couple of rods distance from the stable door. Then where can the benefit be? Either let them stay in the stable, or else let them out and see that they are driven a certain distance and back again—for exercise.

Mr. GRISDALE: I think Mr. Dargavel must have been watching the cows after they were a few hours out. I have noticed that in winter the cows walk about more or less except on very cold days. We find that for the first fifteen or twenty minutes cows will move around lively, but if it is cold and they do not move around we put them in at once.

Mr. KIDD: Do you believe in dehorning a dairy herd?

Mr. GRISDALE: It makes the cattle quieter; but if you have a cow whose appearance pleases you do not dehorn her. She will not look so well.

A MEMBER: Is watering once a day sufficient?

Mr. GRISDALE: If you have to drive them far once a day is quite sufficient for the operation. But if you have water convenient you may water them twice. Cows will drink twice a day even with ensilage, although they will not take so much. Fresh cows need to be watered twice a day.

The PRESIDENT: If you wish to get a large quantity of milk from a cow you must give her a large quantity of water. She must be kept in all the time in winter, and every time you let her out of the stable in cold weather she loses milk. If she is a liberal giver of milk, she has enough business to attend to turning her food into milk, which is a good deal of exercise, and I can assure you that she does not need to be raced around much under these circumstances. When the cow fills her stomach thoroughly, and has a nice bed to drop on, if you watch her you will see happiness in her eye showing her contentment of mind, and she will not think of going out for "exercise." (Laughter.) I think she will do much better kept in than by being allowed out, so far as winter treatment is concerned. She must have time to chew her food in comfort. Do not depend too much upon exercise. I know farmers who are using a flail during the winter, and it gives them nice exercise. (Laughter.) The ideal watering trough for a dairy stable is a clear, pure spring about forty feet above the stable site, and let that blessed water with its grand reviving power run through the stable. If you can warm the water for the cows in winter, do so. It is best with the chill taken off. About seventeen years ago I was advocating the use of ensilage corn in the winter, and also urged that warm water be given, and some of the fellows just about hissed me. But last fall I was invited back to

that place, and I found that most of them had followed my advice, and were doing well. Well, I repeated the address of seventeen years ago—a little more polished, of course, and more up to date—and I was cheered to the echo. Every speaker there that night thought just as I did seventeen years ago. Their motto now is that the cow must have the very best opportunity of doing her best work. Harris Lewis many years ago at Brockville advocated shutting the cow up in winter, and keeping her as warm as possible so that she might give us $50 or $60 worth of milk instead of $20 or $25 as was the average then. I want down to his farm in the old Mohawk valley, and saw him at home. I noticed that when he went into the yard the cows all came towards him, with apparent pleasure. I know some dairy yards where as soon as the gentle husbandman appears the cows turn tail and flee in dread from him. Mr. Lewis showed me the record of every cow in his herd. He knew just what each and every animal was doing. Now, take my advice and weed out every cow that does not pay for her keep and give you a profit. Beef her, or sell her to some neighbor who likes to keep cows just for the fun of the thing. (Laughter and applause.) Good dairy cows should be kept in during winter, as a rule. Of course on a really warm, nice day she might be let out if she cared to go. Keep her warm, with a good bed, plenty of proper food, and she will repay the best attention you can give her. Feed her with a ration that will not cost too much, for the best rations are not the costliest ones. With ensilage, meal, and oats, and some clover hay she will be almost up to June conditions. Feed her twice a day, and a nice little lunch of well-saved clover hay at noon, just to tone up her system, and that animal will pay you over and over again.

Mr. GRISDALE: I am delighted to see that you have come back to feeding three times a day. (Laughter.)

A MEMBER: Is barley a good food for a cow?

The PRESIDENT: It will do if she is not giving milk. Bran is the most profitable thing for milch cows, and it will also make more manure for the same money than any other really good cattle food. It will pay the dairyman also to raise large quantities of peas and oats. Enrich your land from year to year, by keeping a good, well selected cow, feeding her with the best food, and returning to the soil all the manure.

Mr. GRISDALE: Let me say a word here regarding the best thing for supplementing pastures during the summer drouth. Soiling, or giving green feed to cattle, is a wise and necessary thing. It is well to start before the pastures are entirely burned up. Have something ready to supplement the grass before the end of June. It must be a quick-growing crop. I consider oats and peas mixed in about the same proportion to be the best thing for supplementing pasture during drouth. And this can be kept up by sowing small sections every week for about three weeks. By that time the new corn will come in, which is also a good aid. You may also use vetches; but the trouble with vetches is that you are likely to have them come up more or less the following year, which is not an advantage. Peas, oats and barley also make an excellent mixture. In some parts of the Province sorghum may be sown, but if the season is not favorable it is not likely to be a good crop to use. We have not used lucerne as a soiling crop, it is generally a failure with us, although we had a good crop last year.

The PRESIDENT: What is your opinion about ensilage in summer to supplement dry pastures?

Mr. GRISDALE: Ensilage is a good thing in such a case, if you have it. I might add to my recommendation of oats and peas as a soiling crop the hint that it is not well to feed the mixture too young, or it will be too sappy. And so with all these special summer crops. It is not well to use rye in this connection, as it is apt to be too woody or fibrous, and a fungous growth comes upon it called ergot of rye, which causes abortion.

A MEMBER: What about light or absence of light in the stable in the winter time? Is plenty of light necessary to the health of animals as well as to plants? For myself I believe in plenty of light in the stable.

Mr. GRISDALE: I believe you are perfectly right in desiring plenty of light. The nearer we follow the laws of nature the better. Light is the best germicide known.

A MEMBER: What would you substitute for clover hay?

Mr. GRISDALE: If you have no clover hay the best plan would be to go and buy some really well-cured clover hay, for there is nothing better than that, otherwise you

will have to fall back on some other hay or straw; but no other thing in that line can equal clover hay. In case you have no hay you may feed unthreshed oats to advantage. A mixture of peas and oats cut in the last part of the milk stage might in some measure take the place of clover.

Mr. MULLETT: Which do you prefer—oatmeal shorts, or bran and wheat shorts?

Mr. GRISDALE: Bran and wheat shorts, for that is a known quantity. The protein in oatmeal shorts is a very variable quantity. We find that it varies as much as five or six per cent. Sometimes oatmeal shorts are good, and sometimes they are not worth taking home.

PASTEURIZATION AND THE USE OF PURE CULTURES IN BUTTER-MAKING.

BY J. W. HART, SUPERINTENDENT DAIRY SCHOOL, KINGSTON, ONT.

It is now about ten years since Storch, the eminent Danish dairy expert, announced that the flavor of butter could be modified by the use of different cultures of bacteria in pasteurized cream. At the present time about 95 per cent of the creameries in Denmark pasteurize either the cream or the whole milk. As Danish butter sells for higher prices than any shipped to the British market, it would seem that no other arguments were necessary to convince every practical butter-maker of the utility of the practice when the cows are kept in the stables. On the other hand extensive trials conducted by the Dairy Division of the Bureau of Animal Industry, United States Department of Agriculture, in several States, fail to show that pasteurization is of benefit in summer when the cows are at pasture, either making butter for export, or for domestic consumption.

By the pasteurization of milk or cream, we mean exposing it to a temperature high enough to destroy practically all of the germs present, and afterwards cooling the milk or cream to a temperature of 50 degrees or lower. The standard temperatures for the pasteurization of milk are 150 degrees for 30 minutes, 160 degrees for 15 minutes, 170 degrees for 10 minutes. If the milk is to be used for butter-making no injury will result if it is heated to a higher temperatures, provided it is cooled quickly afterwards. No matter how particular the patrons of a creamery are in caring for their milk during the winter, it will contain an abundance of germ life. The greater portion of these germs would be injurious to the flavor and keeping quality of the butter, and by pasteurizing we kill off good and bad alike.

The effect of pasteurizing alone upon the butter is to drive off a great deal of the flavor, so it is well to consider the sources from which the flavor of the butter is derived, and how it is affected by the heat of pasteurization. Several distinct sources of flavor in butter are recognized. We have first, the volatile flavoring oils, those pungent aromatic oils that are easily converted into vapor. When present in the food they are carried through the cow's body into the milk. On good upland pasture in summer, the herbage imparts an agreeable flavor to the milk and whatever product is manufactured from it. The same effect is observed in winter when fragrant early cut hay is fed. The volatile flavorings oils of the turnip and onion, on the other hand, are anything but agreeable. The second source of flavor in butter, is the cow herself. Dairy products made from the milk of fresh cows will have a finer flavor than where made from milk of cows well advanced in their lactation period.

Another source of flavor in butter arises from certain products given off in the growth of bacteria. Certain varieties of lactic acid producing germs have the property of imparting to the butter a more agreeable flavor than some others, and it is these lactic acid germs that produce agreeable flavors that the butter-maker should endeavor to cultivate in the starter he uses, whether butter or cheese is the end in view.

Another flavor from a different source would be very evident if the milk had been in close proximity to any loud-smelling substance, or to the butter had been added salt that had absorbed odors injurious to it.

Flavor from whatever source is volatile, and may be and (in pasteurizing) is, to a considerable extent, driven off by the heat generated. In pasteurizing milk or cream we

get in the butter something of an insipid or flat flavor, or absence of flavor, showing that the quick, lively or volatile flavor of the butter has been removed by the process. It is just here that a heavy starter containing the right kind of lactic acid germs is needed to ripen the cream, so as to get a fine aroma in the manufactured products. The same principle is illustrated by the farmer, who, in summer fallowing his field, kills the weeds and germinating weed seeds, sows clean seed, and reaps a clean crop.

Two methods of pasteurization have been employed at the Kingston Dairy School, that of pasteurizing the whole milk and pasteurizing the cream after it had been separated. The whole milk is pasteurized by means of Reid's pasteurizing apparatus. The operation destroys a large proportion of the germs liable to cause objectionable flavors in the butter, drives off much of the volatile flavor present, and leaves a fairly clean soil for the propagation of germs afterwards added to the cream in the form of a starter. Connections were made so that the exhaust steam from the engine could be used for heating the milk, but it was found in raising the temperature to 160 degrees that there was considerable back pressure on the engine, so that it was not apparent that there was any economy in using the exhaust steam. In separating at 160 degrees as compared with 90 degrees, there is a great gain in the capacity of the separator. Our work confirms the results secured at the Wisconsin Dairy School, where it was found that the quantity of milk fed any of the separators could be increased one-half and have the skim-milk test no higher in fat. This means practically that if 2,000 lbs. per hour could be fed through a machine at 90 degrees, leaving one-tenth of one per cent. of fat in the skim-milk, at 160 degrees the feed might be increased to 3,000 lbs. per hour with no increased loss of fat. Trials at the Kingston Dairy School show that a separator handling 3,000 lbs. of milk per hour at 80 degrees left in .12 per cent. fat, while at 160 degrees there was no trace of fat on the neck of the double-necked skim-milk bottle when 3,300 lbs. per hour was fed. The fact that the capacity of the separator can be increased by 50 per cent., or the efficiency of an inferior separator may be improved to such an extent that there is no appreciable loss of fat in handling the milk, is a matter of great importance, and the value of butter fat saved would in many creameries pay (in a single season) for the installation of a pasteurizing plant.

The great objections to pasteurizing the whole milk are that it requires considerable fuel, and the separator bowl clogs sooner ; but, if there is a large amount of milk to be fed through the machine, there will still be considerable gain in time on account of the increased capacity of the separator when the milk is heated to 160 degrees. Heating the milk to separating temperature in the vat is decidedly objectionable, and the Reid pasteurizer is a convenient medium for heating and elevating the milk to the separator.

Another advantage of pasteurizing the whole milk is that the germs are killed before they have any opportunity to multiply. Where the milk is heated to eighty or ninety degrees for separating, we have the most favorable temperature for their rapid multiplication. The patrons of our winter creameries now realize the high value of skim-milk as a food for young animals, especially calves. They demand that it be returned to them sweet. Failing to have the skim-milk sweet for the patrons, will cause many farmers to keep their milk at home, either using gravity creaming, or getting a hand separator. Unless the skim-milk is pasteurized it is practically impossible to have it sweet for the patrons.

In Denmark bovine tuberculosis is so alarmingly prevalent, that the milk is of necessity pasteurized to prevent the spread of the disease. While we have practically ignored this phase of the subject, is it not time to enquire if there is any great danger of spreading this and other infectious diseases by means of raw skim-milk returned from the creamery and if there are not occasional sporadic outbreaks of disease that could be traced to this source ?

In regard to the keeping qualities of the butter made from pasteurized cream, we find that it will keep far better than the butter churned from raw cream. Indeed this is one of the strongest points of the practice. The butter always appears fresher, and in shipping it to the British markets, there will be no necessity of using any injurious chemicals to preserve it. There is no loss of yield in pasteurizing if the cream is properly handled.

Tests of the butter-milk made daily at the dairy school, rarely show 1-10 of one per cent. fat, usually the tests reads much lower. Of course a rich cream is handled, containing thirty per cent. or over of fat.

A necessary adjunct to a pasteurizer is a good cooler, over which or through which the cream should be run as it leaves the separator. If the *milk* is pasteurized the cream will leave the separator at a temperature of 120 degrees or thereabouts, and is therefore much more quickly and easily cooled than if the *cream* were pasteurized at 160 degrees. Neglect of thoroughly cooling at this stage will render the butter greasy or salvy.

The sooner the starter is added after cooling cream the better. A two per cent. starter should thicken the pasteurized cream in eight or nine hours at a temperature of sixty-five degrees, after which the cream may be cooled to churning temperature. The commercial ferments that have been used at the Kingston Dairy School are Hansen's Lactic Ferment, and the Orin Douglass Butter Culture. The former we have used for several seasons. By its use we get a more acid cream and a higher flavor. With the Douglass butter culture, a pure culture of the micro coccus butyri aromafaciens, we get a much milder flavor and aroma, where the cream is thickened to the same consistency as when using Hansen's color. Either culture when properly used will give us the finest flavored product, and enables us to secure the highest prices on our home market From what experience I have had with the Orin Douglass Butter Culture, I believe that by its use we will get that mild, rich, melting flavor wanted in butter for export. It has proved entirely satisfactory in making butter for the home trade.

No starter, commercial or home-made, can be successfully propagated unless the most scrupulous cleanliness is employed in every stage of the process. To the thorough washing and scrubbing of every utensil, should be added scalding in clean boiling water or live steam. The ordinary deep setting cans are convenient in size and shape for propagating the starter. To properly carry on the fermentation from day to day, there should be two cans, each covered with an over-lapping removable lid, which will prevent any germs from the air getting in. For heating the milk a sixty pound spruce butter tub can be used. It should be set on a shelf about three feet from the floor. There should be a hole about two inches from the top of the tub to take off the over flow. A steam pipe with a valve should be run down into the tub and terminate about three inches from the bottom. In using, the can containing the milk has to be set in the tub and a pail of water poured around it; the steam may then be turned on while the can is gently rotated from time to time to allow of the even distribution of the heat. Enough steam should be supplied to keep the water in the tub boiling. After an hour the milk should be cooled to seventy degrees before adding the culture, after which it may be cooled to sixty or sixty-five. A second tub can be turned up-side down over the tub containing the starter, to keep the temperature uniform. It should be stirred with a scalded dipper a few times in the first three hours; afterwards the can should not be disturbed until the starter thickens, which it should do sometime inside of twenty-four hours. After the starter has thickened it should be stirred to a smooth and uniform consistency something like thin cream.

The freshest and cleanest milk only should be selected for a starter, and a fresh batch should be prepared daily. It would be found to be most vigorous about the time the milk has curdled. It should keep good for a couple of weeks, but may not get contaminated with injurious organisms for a month, if great care be exercised. When it commenced to go off flavor it should be thrown out and a fresh batch started.

A MEMBER: Do you object to pasteurizing in the vat?

Mr. HART: Yes. The disadvantge is that your milk will be cooked in the vat. Then, again, your factory would be filled with steam. I think that even heating in the vat is objectionable, the milk is apt to thicken.

Mr. NEWMAN: Is it not harder to keep the flavor with whole milk than with skim milk?

Mr. HART: Yes. And for that reason we have put in a small hand separator, for the purpose of separating the milk for the starter.

Mr. NEWMAN: Someone has said that a starter is like a shot-gun: In competent hands it is a good thing, but in other hands it is a danger. I have made a little study of the subject, and I have found out that the reason the skim-milk is so hard to handle is that the butter fat in it is attacked by germs which produce butyric acid, and so it is

better to keep it stirred until nearly the time of coagulation. That will keep the cream down. If you do not stir it enough it will make curds and whey.

Mr. HART: By separating the milk you get rid of a good deal of that injurious matter.

Mr. NEWMAN: The best covering for a starter can is to get some cloth used for bandaging cheese, damp it, and place it over the cover of the can.

Mr. HART: There is a danger of your bandaging getting too wet and dripping. I have also used some paper with advantage.

Mr. MALLORY: How are these starters put up? Are they practical for a private dairy?

Mr. HART: They are in a powder form, and will keep for from two weeks to a month. Once started you can progagate your own starter just as you would yeast.

Mr. J. AUG. HAYES: At the St. Hyacinthe Dairy School they advise the pasteurization of the cream in preference to that of the whole milk. They hold that there is a difference in the churnability of the cream, and that the pasteurization of the cream is preferable to the whole milk on that account. It is easier to keep the cream isolated than in the case of the whole milk.

Mr. HART: I have not made any test in that direction—that is, dividing the milk into two parts and using the cream in one experiment and the whole milk in another. We have found, however, that the buttermilk tests less than one-tenth of one per cent. and we have never got a reading higher than two-tenths of one per cent. Of course prices range a good deal at Kingston. Last Saturday roll butter sold for 25 or 26 cents on the market. Pasteurizing has the tendency to make the butter a little paler, but the color can be kept uniform.

A MEMBER: Do you think pasteurization pays for the extra work involved.

Mr. HART: Yes. We have found it so, especially when the butter is exported.

The PRESIDENT: I think so, too.

Mr. HART: I believe that pasteurization of milk in butter-making is the plan most calculated to improve our export butter trade. In fact, without pasteurization a fine quality of butter cannot be made here for the British market; but by its aid we would be placed on an equal footing with the dairymen of Denmark in everything but distance from the market. Pasteurized butter has better keeping quailities, and if general in Canada our butter would soon sell for about the same price as the Danish. Pasteurization was carried on in about 95 per cent. of the Danish creameries, and was largely practiced in Australia and New Zealand. The best creameries in the United States and Canada are also pasteurizing for butter-making. The speaker then described the system in detail as practiced in the Kingston, and declared that the plan was capable of being conducted in any well regulated creamery.

THE ROMANCE OF AGRICULTURE.

Mr. C. C. JAMES, Deputy Minister of Agriculture, delivered a comprehensive address entitled "The Romance of Agriculture," which was full of historical and statistical facts, given in a simple and popular form. The immense value of agriculture as a source of national wealth was shown by comparison with the value of the output of the mines, forests and fisheries of the Dominion and of the world. He also explained the important part played by clover in the development of nitrogen in the soil, and in an interesting fashion applied this to tillage and rotation. Much interest was manifested as he described the various modes of meeting and overcoming the San Jose Scale and other insect pests of the field and the orchard, and showed how millions of dollars annually had been saved to the country through the investigations of Government entomologists. Incidentally he paid a high tribute to the late Prof. Riley, for his work in economic entomology. He cited the case of Dr. Bull, who discovered and developed the popular grape known as the Concord, as an example of the wealth-creating work done by horticulturists. He also pointed out how Prof. Conn, the bacteriologist, had discovered the germ which gave a peculiarly rich flavor to some Uruguay butter, how he made a culture of it, and had thus produced that commercial "starter" which imparted that same flavor to butter.

Mr. A. F. Wood: I cannot refrain from expressing my admiration at the manner in which Mr. James has handled his subject. He has given us the romance of agriculture in a most delightful manner, but he has also shown us the intensely practical work done along some lines of agriculture by various Governments. I have been particularly interested in what he said about combatting the San Jose Scale and similar pests. In the spring of 1896 I was in Southern California with my family. I was going through an orange grove with my brother in-law, when he exclaimed, "Ah, I see the red scale is here!" The black scale is usually disposed of by fumigation, but this red scale is much more dangerous and hard to get rid of. There was a central depot in that part of the state where the parasite referred to by Mr. James was kept. My brother-in-law added that if he let the scale go for a week or so longer it would be all up with his orchard, so he wrote at once and by return mail received half a dozen of these beetles in a little box, and in a short time all the insects attacking the orange grove were devoured. The beetles died only after the insects upon which they fed were all gone.

THE KINGSTON DAIRY SCHOOL.

By J. W. Hart, Superintendent.

Having been requested to give an off-hand description of the work done at the Kingston Dairy School I shall do so as briefly as possible. This institution was organized six years ago by the Dominion Government, at the suggestion of Prof J. W. Robertson, Commissioner of Dairying and Agriculture. It was at first run in connection with the School of Mining attached to Queen's University. Mr. J. A. Ruddick, a former instructor of this Association, was the first Superintendent. The School is now controlled by the Ontario Department of Agriculture. For a time the School found much difficulty in getting an adequate supply of milk for practical instruction in cheese and butter making, but now there is no difficulty in getting from 6,000 to 8,000 pounds daily, which permits the making of cheese and butter on a factory scale.

The School is opened in the fall, after the factories are closed, and is closed in the spring. There is a long course in either butter or cheese-making, or both, and there are short courses of three weeks each in either cheese or butter-making. We have a full staff of practical instructors, and students are instructed in every branch of the business, if they so desire, including cheese-making, cream separation, butter-making, milk testing, dairy bacteriology, pasteurization, testing, etc., besides the business side of keeping factory records, accounts, etc. Students for the short course must be above sixteen years of age, and must have had at least one season's experience in a factory or creamery. Those taking the long course must have had two or more years' experience in practical work. The School is for the benefit of cheese-makers and farmers generally, and while the theory of cheese and butter making is fully given, the practical part of the work is most thoroughly performed. The man who spends some time in such an institution as ours will go back to his factory not only able to do better work, but determined to do it. In fact, some of our factories in engaging a new maker now make it a requirement that he shall have taken a course at the Dairy School. We have had many assurances from Presidents and managers of factories of their sympathy with us in the work we are doing. We claim that at Kingston to-day we have a staff of dairy instructers equal to the staff of any similar institution on the continent. And we do our work at a less cost than any other place doing the same kind of work. In Wisconsin they have spent $40,000 in erecting Hiram Smith Hall, and in connection with Cornell University they have put up a dairy building at a cost of about $20,000. They have well-equipped milk laboratories, etc., and go into it more extensively than we do; but for all practical purposes I think we are able to do the very best work, and the man who takes a thorough course with us is able to go out and do work that will be a credit to himself and to the country.

Students make the butter and cheese under the direction of the several instructors, doing the routine work from day to day as it should be done in a modern factory. Records are kept of all steps in the process of manufacture from the time the milk enters the weigh-can until the finished product leaves the school. The attention of the student is called to the points in manufacturing where losses occur, the causes of and the means

of reducing them are pointed out. To those who have given the matter any thought no argument is necessary to prove that a man trained in this manner will, in the average factory, save more than enough in the loss of valuable milk solids to pay his wages as compared with the man lacking the training, to say nothing of improved quality whether butter or cheese is made.

The cheese-making department contains all the apparatus found in an up-to date cheese factory, including five cheese vats, upright and gang presses, various styles of curd mills, etc. Three curing-rooms, one of which is connected with a sub-earth duct, are in use where the effects of different temperatures and degrees of moisture upon the curing of cheese are studied.

The equipment of the butter-making department is being added to from time to time. It now includes five of the leading styles of separators, milk and cream pasteurizers combined churn and butter worker, trunk churn, ejectors, in short, every appliance used in the manufacture of butter after the most approved methods.

Several of our instructors are also inspectors and instructors of this Association. These men during the summer, or regular making season, are on their rounds among the factories, and give valuable advice in the short time at their disposal. But at the Dairy School they can have the makers under their direction not for a few hours, but for days and weeks together. Now, we do not claim that we can take any kind of a man and by giving him a term at our Dairy School make a good cheese or butter maker out of him; but we do say that any ordinary intelligent maker who will take a course at our school will be a better maker of cheese or butter after that than he was before, that he will be a wiser and more practical man in his methods, and that he will be worth more to himself and to those who employ him.

The charges for attending the Dairy School are merely nominal. The sum of $1 is charged for registration, and another $1 is deposited to cover incidentals. There are no other charges, as the institution is maintained by the Provincial Government. Of course the student will have to provide for his board and lodging, travelling expenses, etc. We have twenty men under instruction now as against sixteen at this time last year.

The examination at the close of the term is of a very thorough and practical nature. The student is made to tell his reasons for the various operations he is supposed to perform in making first-class cheese or butter. There is no rule of thumb allowed. He learns the "why" as well as the "how" of the business. He takes a vat of milk, for instance, and is supposed to handle it so as to bring out a fine quality of cheese. If he succeeds he gets a professional certificate; if he fails he is not granted one. In addition to the examination he must pass a year in charge of a factory before he receives his certificate.

There are two other Dairy Schools in the Province, the Central, at Guelph, and the Western at Strathroy. There is also one at St. Hyacinthe, Quebec, another at Nappan, Nova Scotia, and one in Winnipeg, Manitoba. We are greatly cramped for space, and a larger building is very much needed. With better quarters we think we can do still better work.

A PIONEER CHEESE BUYER.

Mr. Thomas Watkin, of Belleville, who was introduced by the President as a veteran cheese buyer, said: The year 1870 was my first year in the cheese business in Belleville. At that time I could count upon the fingers of one hand all the cheese factories in the section. In the immediate vicinity of Madoc there were none at all. Since then the people of this part of the county of Hastings have made great strides in dairying. A man one said that he never met a pig on the road without feeling like taking off his hat to the animal, because he had made so much out of the bacon trade. And many of you farmers around Madoc and throughout eastern Ontario should feel like taking off your hats to the cow, for she has made a good deal of money for some of you—when you treated her properly and gave her a fair show.

In regard to the quality of Canadian cheese, I am free to say that there is yet a good deal of room for improvement of the average make. We have a good number of factories

where the finest cheese is made, yet too many of our factories turn out a poorly finished article, and thousands of dollars are lost to the country annually on account of sour, unfinished cheese, which soon go off flavor, and have an unattractive appearance. Sometimes the buyers have to shoulder the loss. We can have a much better average of cheese, and this Association is going to assist in this work in the future as it has done in the past. But the very first step in improvement in the quality of our cheese must begin on the farm where the milk is produced. The patrons must be taught and encouraged to take better care of milk. This is a most important matter. When the milk is got into the factory in first class condition the foundation is laid for a good article of cheese being made. What the foundation is to a house a good quality of milk is to a cheese. I think also that it would pay our factories to have double or even treble the visits that they now get from the instructors and inspectors. (Applause). Then there is the matter of rennet. I am of opinion that much of our cheese that has been poor in flavor during the year has been so because of poor rennet, and the way it has been used in developing the curd. I believe that all the liquid rennet coming into the country should be tested and analyzed. I am fully persuaded that it would pay to have this done. I also wish to place myself on record as against the custom of having the whey drawn back to the farm in the milk cans. I am satisfied that a good deal of cheese is injured by that practice; it develops a bad flavor, and means a bad name for our cheese generally. I cannot speak too strongly against this plan. Some years ago I was buying cheese near Picton, in Prince Edward county. It had been of good quality generally, and I did not pay close attention to the last shipment on that account. Complaints came from the other side of the water that the cheese was bad. I could not understand it until I found that the whey tank was being kept near the factory, and the condition of affairs there was very bad. I could not only see the whey tank, but I could also smell it. That factory lost $300 on account of the poor quality of the cheese. There are very few factories in Canada that are properly fitted with curing-rooms for turning out the very best cheese. In the average curing-room the cheese becomes heated in the summer, and if once heated cheese will not get better. I would also suggest that we should be more particular in boxing our cheese. Greater care should be exercised in having the scale-boards placed just so, and the box should be cut down to near the cheese. It is not good for a cheese to be rattling around in a box, and it is not good for the box either. And when the cheese is going out of the factory, whether it be in the summer or in the fall, take care that the waggon is nice and clean, and a little straw put in to keep the cheese steady and fit, and do not forget to put on a cover or tarpulin to keep out the dust or the rain. It is important that the cheese should be made well, and it is also important that they should arrive in England in the best possible condition. I think we sometimes make a mistake by cracking up our cheese too much. England makes perhaps the best cheese in the world, but it is on too limited a scale. Canada averages a fair quality of cheese, but while the best is among the finest quality to be found anywhere, there is room for improvement in many quarters. Let every cheesemaker and factory man here go home determined that Canada will touch the top notch in the future quality of her cheese. We can do that if we all try our best. Let us lead in both quantity and quality. I quite agree with the President when he warned you against making cheese before the first of May and after the first of November. If the factorymen will take the hint he has given they will never repent of it. In a season when there is a glut in the market cheese made too early and cheese made too late in the year make the prices go down still further.

The President: I am much pleased with the practical and timely remarks made by Mr. Watkin. Every cheesemaker in the section should be here and pay heed to these words of a veteran buyer and handler of cheese. As he says, we must make a finer article of cheese; and we will do it. I repeat that cheese made before the first of May and after the first of November is not the kind of article with which we can compete against the world. I have a report this morning of the cheese shipped from Canada during the year up to the first day of January, 1900. I find that there is a slight falling-off in the number of boxes of cheese exported, but a large gain in the number of packages of butter sent to England. Of course there are a number of men who are keeping cheese back, as the market looks well just now. The figures are: Exports of cheese for the year, 2,403,675 boxes, against 2,419,706 boxes in 1898, or a decrease of 16,031 boxes. The export of

butter has reached 575,985 packages, or 189,646 packages more than in the preceding year. When you consider the value of a package of butter, you will see that there had been a most gratifying increase in the export. Now, if you are making cheese, do not quit that business and go into butter-making. But, if you are going to build a dairy establishment in a new locality, I would advise you to put up a butter factory. We must have larger factories and more concentration of business, which will cheapen the cost of production. If a man gets dissatisfied with a factory, he should not go off and endeavor to start another one on the next four corners in opposition. Do not get on the fence between two factories and drop on this side or that for the sake of a dollar. Stick to your factory loyally, and you will never regret it.

GOVERNING PROPER CONDITIONS IN THE CURING-ROOM.

By J. W. Newman, Roebuck.

After the intelligent dairymen have produced, cared for, and delivered milk to the factory in the best condition, and the up-to-date cheesemaker has made it into cheese capable of reaching great excellence, there yet awaits a very important step, viz., proper curing.

The curing of cheese is brought about by the growth and multiplication of certain forms of bacterial life, and we must fulfil the exact requirements for the particular forms of life that we require if we produce that mild, rich cheese for which the British market now calls. The particular forms which we most require seem to thrive best at a temperature of about 65° F., with relative humidity from 60 to 70, in a clean, sweet, well-ventilated room. Prof. Dean and others have shown us the great advantages obtained from these conditions, but how are we best to obtain and govern them ?

I shall now endeavor as briefly as possible to give you an outline of several methods, together with their advantages and disadvantages, in the hope that I may perhaps induce someone more capable than I to take up the subject and give it the prominence and thorough discussion which its importance would seem to warrant.

1. Every factoryman must see that his curing-room is properly insulated, so that heat cannot pass through either way. This can be done by having the room thoroughly surrounded by a *real dead air space* of four inches in thickness. Too many doors and windows are bad, as they are sure to conduct heat and allow hot air to pass through either way.

2. Color affects radiation, and it is a great advantage to have the room whitewashed inside and painted white outside, as it will keep cool or warm, as the case may be, much longer.

3. Every cheesemaker should supply himself with a wet and dry bulb thermometer and scale indicating relative humidity, and also a maximum and minimum thermometer, and keep a daily record of each. Experience will soon teach him at what points these should be governed in order to obtain the best results.

Just here it will add interest to our work to learn exactly what heat and cold are. Heat is a motion among the molecules of matter. Cold is a term of negation, signifying merely a greater or less deficiency of heat. It is not an entity; hence, when we talk of producing cold, we really mean reducing heat.

Heating.—When weather is too cold, we have to heat artificially. This can best be accomplished by steam pipes from the boiler, which will distribute the heat evenly throughout the room. Often in early fall and late spring the heating is neglected, due to inconvenience, but with this plan the simple turning of a valve makes the desired temperature. In this room we have not only the heat that is in the steam, but we also have the process of steam changing to water, which generates great heat. This distilled water is the very best to use again in the boiler. One foot of inch pipe for every twenty cubic feet of air space in room is sufficient, and is not expensive, as most factorymen can now do their own fitting. This also requires one less fire about the building, thus reducing the danger. Where a furnace could be put below a curing room, it would work very well, but the old-fashioned stove system should be placed among "the things that have been," as it causes some cheese to fry while others may be near the freezing point.

Cooling.—Many different methods of cooling are now in use, and some are quite applicable where others could not be used. Every factory man should adopt some plan, and let that be the one best adapted to his particular conditions. The sub-earth duct, ice-racks and cooling by the well, are each excellent methods, and fully described in the report of last year's conventions, east and west. A very good method of automatic cooling is to have an ice house built beside the curing-room. Lay in the bottom from three to six lengths of metal pipe (like that use in city water works). Let one end escape in curing-room and to the other end attach a galvanized iron pipe leading upward and at a height of about twenty feet fix a cowl on it. Have a ventilating pipe from curing room to ensure a draft, and place a damper in first pipe to check draft when the necessary temperature has been reached. Fill the ice house as usual. This is quite effective, and saves the labor of handling and cleaning up after ice.

Another simple and yet practical method is to build a curing-room apart from factory proper and build low or without loft, and force Nature to fulfil our requirements. Nature is like a wonderful machine with large pulleys running in a certain direction, but if cross-bected will run other pulleys in an opposite direction, or in other words by cross belting Nature's laws we may cause reverse effects. Now, we know that any liquid changing to a gas absorbs heat or renders it latent, and further, that an increased circulation of air hastens evaporation. Now when the hot, dry, summer winds are blowing, by occasionally pumping water in a spray over this low, simple, curing room, the evaporation which ensues will lower the inside temperature many degrees. If this building made of brick it would absorb more water and answer the purpose without pumping so frequently. Further, by growing some vines over the sides and roof of this building the increased surface exposed to evaporation will make this method effective. If these vines were flowering plants, like a variety of morning glories, they would add beauty to the place and be an incentive for better patronage and better milk, for

"Roses will bloom nor want beholders.'

Some shade trees near by to protect this building from the radiating powers of the sun would also favor this system.

The last method that I shall describe is by the use of compressed air. When air is being compressed it becomes very hot, and if while in this state the heat is allowed to escape in surrounding air, water or ground until it is as cool as we can conveniently get it, and then conducted by means of a pipe, and let escape in curing-room, it here lack the heat it has given off outside and is therefore cold. At 100 lbs. pressure last summer, we succeeded in reaching a temperature of 32° F. or freezing point. However, there are certain obstacles in the way of this system in not having exactly suitable machinery, but it is not without many advantages. I believe the results already secured in cooling by this means would warrant the Government in making further investigations along this line and endeavor to have it simplified, and I believe ere long it will, and this method will be used to the advantage of many. Some of its advantages are :

1st. The exhaust steam and first coil of air pipes could be used to heat water for washing and for boiler.

2nd. It would not take up the time of cheese maker when he is busy and therefore not so apt to be neglected.

3rd. In expanding could be made to do such work as press cheese, pump water and and whey, hoist milk, cut curd, etc., and let exhaust go in curing-room.

4th. While its relative humidity is high it causes a circulation of air, and therefore renders the best condition for curing cheese without mould.

5th. Any temperature can be maintained at any time. No danger of ice running out.

6th. It is clean ; no dirt to be cleaned up.

7th. When it is once fixed right it will last for time indefinite, and is not attended with the annual labor and cost, or the short endurance of an ice house.

In closing, I would say let us each persist in yoking the forces of heaven to do earth's work, and stir up our latent energies to a determination to win success, which is open to everyone, who is willing to pay the price.

CHEESEMAKING.

By G. G. Publow, Kingston Dairy School.

I might say there is no royal road to knowledge in the manufacture of cheese. Scientific teaching has done a great deal to raise the general quality of cheese, but even science must be supplemented by judgment and skill on the part of the maker, whose qualifications largely depend on experience. The object of a cheesemaker should be to obtain the largest quantity of cheese of the highest possible quality. I find that the cheese most sought after should be soft and fat, neither hard nor crumbly. It should have both the aroma and flavor of a nut—the so-called nutty flavor so much sought after. It should melt in the mouth, producing not only an agreeable flavor, but leaving a most pleasant after-taste. It should taste neither sweet nor acid If either in smell or in taste there is anything unpleasant, such taste or smell is termed a taint. The first thing essential for cheese of this quality is to have milk of normal composition from healthy cows, and perfectly clean. Without this no skill on the part of the maker will insure success.

A few of the reasons why cheese are not of this quality are: The milk may have been set too soon, or not soon enough. It is of the utmost importance to have the milk in a certain condition at the time of adding the rennet. If the rennet is added at the right time, so to speak, the cheese is half made. A cheesemaker may have bad results from heating too fast, too high, or not high enough; from the use of too much or too little rennet; from not drawing the whey at the proper time; from improper draining: from lack of maturity at the time of salting; from the use of too much or not enough salt; the curing-room may have been too hot or too cold, too damp or too dry. From what has now been said, it will be seen that the making of fine cheese is not the result of chance, or a process likely to be hit upon by accident, but that experience, based upon shrewd and systematic observation is alone to be relied upon.

Mr. James Whitton: There is a question coming up in our factories to-day which I think ought to be discussed here. There is an idea abroad in various quarters that certain factories are taking too much milk to make a pound of cheese. Throughout the Belleville district the fat usually tests about 3.6 per cent. I would like to find out here how much milk at that rate should be required to make a pound of cheese. Some factories are reporting that they are making cheese from ten pounds of milk, while other factories require eleven pounds of milk to the pound of cheese. Now, if I was going to hire a cheesemaker, and he told me that he could make a pound of cheese from ten pounds of milk or less, on an average, I would tell that gentleman that his services were not required. (Applause.)

Mr. Publow: The question put is practically, how many pounds of cheese can be made from say 100 pounds of milk, testing 3.6 butter fat. The amount of cheese that can be made from a given quantity of milk can be influenced by the treatment given. I have found by careful experiments that from 300 pounds of milk I can make from half a pound to a pound extra by the manner in which the curd is piled in the vat. I thought at first that I must have made a mistake. But I have taken 600 pounds of milk and divided it equally into 300 pounds, and have piled one vat one way and the other in a different manner. One vat was milled early and the other was sheep-skinned down, and we found a difference of from half a pound to a pound in favor of the cheese in which the curd was piled high. But the cheese which contains the most moisture is not the finest quality. If made for quick shipment it would be best, but after a few weeks it goes back. There is a lot of dissatisfaction among patrons over this question of the number of pounds of milk required to make a pound of cheese, and the amount of fat left in the whey. There should not be more than three-tenths of one per cent. of butter fat left in the whey.

Mr. J. A. Kerr: In regard to curing cheese very much depends upon the temperature. There are any number of factories where the temperature is at 85 degrees in the day time and it goes down to 75 at night. Does it make much difference in the quality of cheese made under these conditions?

Mr. Publow: If cheese is cured at a high temperature it should be made firmer to stand it. If cured at say 85 degrees it should be made quite firm. You must give more

acid, but pay attention to the firmness of the body. I would not recommend much over a quarter of an inch on the hot iron. In a lower temperature the cheese does not require to be so firm. The firmer the cheese the more milk it will take to make a pound of it.

Mr. L. E. ZUFELT: There is a demand now for soft cheese, and my experience through the country has been that salesmen are too anxious to get cheese from the factory and are putting them out sometimes as soon as two or three days from the press. Makers are trying to meet the demands of the buyers for soft cheese, and consequently are shipping them too soon after they are made. It is a bad practice and will do injury to the trade.

The PRESIDENT: Any man who will ship cheese only three days old will never see the celestial city. (Applause and laughter.)

Mr. PUBLOW: And I believe that the buyer who takes them will have about the same chance of getting there. The softer we make cheese the sooner it will go to market, but it will be a quick ripening cheese, and it will "go off" flavor early. The man who wants to make or handle these soft cheese must be a little "soft" himself. Too many makers are manufacturing these soft cheese, and they are breaking down in a few days.

The PRESIDENT: Quick ripening and quick rotting.

Mr. PUBLOW: My strong advice is, do not develop too much acid in the curd.

Mr. GALLAGHER: If milk tests say 3.6 per cent. of fat, and it requires eleven pounds to make a pound of cheese, will the amount of cheese increase in the same ratio if the milk tests 4.6 per cent. of fat?

Mr. PUBLOW: That is a hard question to reply to satisfactorily. In normal milk the general rule is that there is about 2½ pounds of cheese for every pound of fat. However, much depends upon the amount of casein present in the milk. If the milk is too rich owing to the very high percentage of fat, greasy curd is likely to result in making it into cheese, because there may not be sufficient casein in the milk to balance the fat. For my own part I believe in paying for milk according to the fat reading—of course under normal conditions. Cattle should receive plenty of green food.

Mr. LYTLE: In our county of Victoria we look for everything good and great to come from the instruction given to the farmers by this Association. Every now and then we have trouble on account of some of our farmers putting in a little water or skim-milk before sending milk to the factory. Some of the factories are going to test the milk with the Babcock instrument, and are going to pay by weight and by the fat reading.

Mr. S. R. PAYNE: I took the course at the Wisconsin Dairy School in 1892, and when I came home I tested with the Babcock tester. I quite agree with Mr. Publow. We found that no one suffers by the use of the Babcock tester. If a man has a number of strippers in his herd, and his milk averages 4.6 of fat, and it is pooled with that of a herd averaging only 3.6 of fat, you can easily see that he is suffering by the transaction. Milk should be paid for both by weight and quality.

Mr. R. COLLINS: In cheese making a good deal depends how the curd is handled. I would like to ask Mr. Publow as to aerating curd after being milled. Some makers keep it covered up from the time it is milled till it goes to press. I have found that the air outside is better than the air inside, and so do not cover all the time. I think the cover could be left up with advantage after the curd is milled for a good part of the time.

Mr. PUBLOW: We take pains at the dairy school to show how to deal with all these conditions. We show the students that the amount of acid in the curd decides as to whether a starter should be used or not. A good starter is a good thing, but it is a curse to the business if you do not understand it. If you get good results without it, never use a starter. If your milk will ripen in proper time without a starter, avoid the use of one. But if the curd is too long in developing we lose fat. If you have tainted milk and open curd then I would recommend the use of a starter. If milk is ripening down fast set earlier. If milk comes in warm it will ripen fast; if it comes in cold it will, of course, ripen a little slower. Watch your rennet test closely, but do not depend upon it too much. Watch how the milk thickens. If the whey expels rapidly cut the curd finer; you will have a fast worker. Now, as to aerating curd: There are seasons of the year when it is advisable to expose curd to the air. I believe in the beneficial action of pure air on curd. After there is a certain amount of acid in the curd I think it is well to give it all the air you can. We get better cheese by exposing the curd to the air under

favorable conditions. We found that midway between salting and the removal of the whey was the best time for aerating. We would expose the curds to the air for about an hour. If the atmosphere is colder than the temperature of the curd I would keep it covered up. If the curd is too warm I would expose it to the pure and cooler air for some time. In the hot weather we found that we got better cheese both in body and in flavor by milling early.

Mr. R. S. ALLAN: Our factory has been erected twenty-eight years, and it is situated on a low piece of land. We keep hogs, and the pens are sixty feet from the factory. We fatten from 200 to 250 hogs yearly, and we have had some complaints of the cheese going off in flavor. We are talking of building a new factory. How near to the old factory would you advise us to build? We have a site on high ground, between 80 and 100 feet from the old site Would that be too close? We are also talking of putting a cement floor in the make-room. Would you approve of it? If so, why?

The PRESIDENT: Have the whey kept ten of twelve rods from the cheese factory, and there used by the hogs. Let each man send a number of pigs to the factory in proportion to the amount of milk he delivers, and also pay his share for the bran and shorts furnished for the lot ot hogs. Then when the animals are sold in the fall he will get his share of the profits. However, if you can rebuild, do so. Prof. Robertson, of the Central Experimental Farm, Ottawa, or the Department of Agriculture, Ottawa, can help you with plans and suggestions free of cost if you write them. I would build a factory on a hill, on a good stone foundation. I would have about three acres of land in connection with the factory, and would have a moveable pen for the hogs, shifting them about from time to time. These animals will summer-fallow the land I would keep the pen as far from the factory as I could. You can pump the whey, or let it run down hill, if on a good high site. You can just coin money by running the business in a clean, up-to-date way like that. The cheese and butter business of Ontario is on a sure and certain basis, and put up a building that will be an ornament and worthy of the trade, and not one through the walls of which the gentle breezes of heaven can play. I would have a cement floor for the work-room, with proper gutters, so that with a hose every drop of the drippings can be washed off. Keep the factory just in such shape that if a lady came came in she could put her foot down without fear of it sticking to the floor.

Mr. PUBLOW: I must say that 175 hogs is a large number to have near a cheese factory. They should be kept no closer than where any bad odor can be detected from them. There should also be the best facilities for keeping them clean.

Mr. J. G. FOSTER: They argue around here that it does not injure the cheese to draw the whey back in the milk cans, and some argue, too, that the cans are more easily cleaned when the whey has been left in them.

Mr. GALLAGHER: The whey tanks at our place are cleaned every two or three weeks, and in this way we find that we can have the whey handled without much danger. Of course a dirty whey tank is always a source of danger.

The PRESIDENT: If the can is first washed out with luke-warm water and then scalded with hot water, and if the can is then turned upside down and the glorious old sun is allowed to beam upon it and purify it, it is all right. But so many people are off visiting, or here and there, and the milk can which has carried the whey does not get a fair show. The whey can needs to be attended to just as regularly and carefully as you attend to your cow. It makes a fellow's heart glad to see the cans clean and shining. Then they look like Canadian factory cans. It is a bad thing for a cheese factory when the milk waggon can be smelt before it can be seen. Sometimes the driver wears the same pair of pants from spring until winter, and only occasionally gets a bath. But, seriously, our milk drivers cannot be too careful and clean in their appearance and in their work.

Mr. PURVIS: The worst flavored milk I ever knew of was brought in a can on which the tin had worn off. I would like to hear Mr. Publow's opinion on the use of such a can.

The PRESIDENT: Such an old can might be used for whey, but never for drawing milk. Do not put a drop of milk in a can on which any of the tin has worn off. Keep your seed peas in that old can.

Mr. BAILEY: I think it would be a good thing if the Association would get an Act passed prohibiting factorymen from drawing whey home in their milk cans. (Applause.)

Until something of that kind is done we can never stop this evil that so largely threatens our cheese industry. I know from my experience when I was your inspector and instructor that this was one of the greatest difficulties I had to deal with—the drawing of this filthy "hog slush" home in the milk cans. Most of our whey vats are not fit to keep whey in, and therefore the stuff cannot be fit to be placed in our milk cans. Sometimes this stinking stuff is kept for twenty-four hours in the can. I think that every buyer will bear me out when I say that they can go into a warehouse and after examination pick out the cheese which have been made from milk brought in cans in which whey has also been carried. I think we ought to carry a resolution at this meeting asking the Legislature to prohibit by law the practice of carrying whey home from cheese factories in milk cans.

The PRESIDENT: This discussion shows that we must have better factories, better makers and better milk. I would advise every maker to attend a dairy school.

Mr. KIDD: It has been said here that we should ask for legislation to prevent the carrying of whey home from cheese factories in milk cans. The proposal is a ridiculous one. I have a cheesemaker who has carried off several gold medals and other prizes at the Toronto and Ottawa exhibitions, and at his factory the whey has always been carried home in the cans. I think we ought to discuss this question right here and now. If the farmers can carry whey home as we do in some of our factories where excellent cheese is made, who shall stop them? Let careful men do it if they wish to. I have heard that when some cheesemakers get a cut in price they make all kinds of excuses, and that while sometimes it may be for other causes they blame it on the whey cans.

Mr. JAMES WHITTON: I would not lay very great stress on taking prizes for cheese. In most cases the cheese is made specially for exhibition purposes. But I am just as sure of it as I am that the sun shines, that to draw whey home in the milk cans is injurious to the cheese industry.

Mr. KIDD: Is the fact that the whey is brought home in the cans any worse than allowing the unwashed cans with the milk souring to be carried home, too? If the cans remain for hours on the stands before being brought home is it not a source of sourness and injury about as bad?

A MEMBER: Is not the milk a little better than that dirty, stinking whey from an old tank? If whey stands in a tank for days it must be bad for the cans and the factory.

The PRESIDENT: I think it is better to bring the pigs to the factory than to bring the whey to them. I know, however, that Mr. Kidd has his whey carried home in an uncommonly careful manner.

A MEMBER: What is the proper temperature for putting cheese to press?

Mr. PUBLOW: It would depend a little upon the season of the year. In summer time the cooler the temperature the better—down to 70 degrees if you can get it. Try and not have it any higher than 80 or 82 degrees. Do not lay too much on the temperature; but if the curd is in proper condition put it in the press. In hooping at a high temperature we are likely to lose more fat in the pressing.

Mr. WATKIN: I am afraid that a great many cheese are not allowed to remain in the press long enough. I would like to ask Mr. Publow how long cheese should remain in the press?

Mr. PUBLOW: Much depends upon the kind of press you use, and the care given in the pressing. I believe that two days are better than one; but at least twenty four hours should be given. If you have a gang press or continuous press that length of time will do all right. With an old style of press you had better leave it in longer.

Mr. HART: Mr. Newman spoke of various methods by which the temperature of a curing-room may be lowered. We are acquainted with most of them, but not so much with the plan of using compressed air. I would like to know something about the cost of installing that apparatus, and the results.

Mr. NEWMAN: The compressor that I got was the Westinghouse air brake pump, costing $8. It does not cost much to set it up. We used 200 feet of pipe, and did the fitting ourselves. We made use of an old boiler as a reservoir, but found that it is not necessary to have so large a reservoir. I found, though, that it would take a very large reservoir to cool over Sunday, and that would be very expensive. In justice to Mr. Hart

I may say that he suggested a tank of brine in the curing-room, through which the compressed air should be allowed to escape. I did not try that plan, but I think it is well worth trying. The compressor can be run at an ordinary rate by an engine of from three to five horse-power. The running of the compressor is not very costly. We have used ice, having an ice-house, but we did not have any racks. But now, if I had to use ice in a curing-room I would have racks I believe the plan of cold water running in pipes around the room is a good one, but I fear the iron pipes will not last long under the peculiar conditions of a curing-room.

The PRESIDENT: The ordinary iron pipe will not last long, but galvanized pipe will. It gives you that moist and cool atmosphere, which is an advantage.

Mr. R. T. GRAY: I have tried this water pipe plan, and have found it a good one.

A MEMBER: In case of grease coming freely after milling, what would you do?

Mr. PUBLOW: In such condition I would add the salt, and work quickly. If the grease still continued, and I found that it could not be prevented by careful handling, I would take off the grease, before salting, by putting on water at a temperature of 90°. It is difficult in some sections at certain seasons of the year to prevent greasy curds. There is not enough casein in such a case to hold the fat.

A MEMBER: Does it injure cheese to have mould on the rind of cheese?

Mr. PUBLOW: Mould does injure cheese. Try and not have mouldy cheese. I would prevent mould coming on the cheese by paying attention to the temperature, having less moisture and warmth, and by giving plenty of light. In a dark, damp room, the place will be full of mould—the very walls will be mouldy—and it will be almost impossible to prevent mould coming on the cheese. Give good ventilation to such a room, and have it whitewashed from time to time.

Mr. TWEEDY: Does piling curd before milling hurt the body of the cheese?

Mr. PUBLOW: It depends upon the amount of moisture. If there is lack of moisture the piling improves the cheese, but if too much moisture is in the curd then piling would injure the body of the cheese.

Mr. S. R. PAYNE: Has anybody had experience with the sub-earth air duct?

Mr. KIDD: We have had some experience; but we found that when the air was warmer outside than in the curing-room we had to close off the duct in order to keep the room cool. We prefer ice. A few pieces of ice on the floor will help to keep down the temperature of a room We find that by placing it on sawdust it gives satisfaction. Clean sawdust is no dirt. By this means we find that we can keep the temperature at about 70°, or about 10° below the average curing-room. Sometimes the sub-earth air duct works satisfactorily, and sometimes it does not. A good deal depends upon the condition of the outside air.

A MEMBER: It is sometimes difficult during warm weather to cook the curd sufficiently firm by keeping it at 100 degrees. The curd knife I use cuts it into five-eight inch cubes.

Mr. DERBYSHIRE: I would have knives that would not cut over three-eighths of an inch.

Mr. PUBLOW: I believe in cutting the curd finer than five-eighths of an inch. I would cut three eighths, or even finer. Do not cook above 100 degrees, or you will be apt to get the curd too firm.

Mr. RUTTER: Does the high cooking hurt the butter-fat?

Mr. PUBLOW: I do not think it does; but you are apt to have the fat leak out afterwards. You had better take a longer time in cooking.

Mr. RENWICK: How would you manage a very gassy curd?

Mr. PUBLOW: If I had no starter to put in the milk I would stir it a longer time before starting to cook to ensure development of the lactic acid.

Mr. ALLEN: Would a cement floor be better than a wooden one in a factory?

Mr. PUBLOW: I do not think it would. I have worked on a cement floor and found it very hard to work on, and found that the cement used to chip and break up, and occasionally crack, and had great difficulty in keeping it clean. I have no doubt that if the cement floor was well laid, that it might do well for a curing-room, but I would prefer a good plank floor, well laid and oiled, for a work room.

Mr. ALLEN: How are ice racks arranged in the curing-room.

Mr. Publow: Last season quite a few of the factorymen put them in in this manner: They made a box about four by six feet, then lined it with galvanized iron and attached an inch and a half steam piping to that, running the pipe around the inside of the building. They had a rack made to fit the box, standing up about three inches from the bottom, and the ice was washed off and put in chunks on those racks and the drippings ran through the pipe around the building. Put in in this manner they were found to work well. I would add that those factories improved their curing-rooms by making the floors and walls tight and providing good ventilation.

Mr. Kidd: I would like to know whether cheese will cure as well in the box after being in the curing-room for six days as they do if left on the shelves? The reason I ask this question is that in our section a great portion of the cheese was shipped in about seven days. My own opinion is that they should be kept at least fifteen days.

Mr. Publow: I do not think the flavor of such cheese will be as good, and they will mould early. Cheese should not be shipped too green, but should be kept in the factory and turned from time to time until a certain amount of moisture is drawn out of it. If cheese are kept on the shelf without turning they will not be of the best quality. The bottom portion will be apt to get bitter if not turned. If the makers persist in selling cheese at a week old or less the patrons should say. "We will not have our cheese sold at this green stage; they must be kept until at least a couple of weeks old." The men who are losing by this unwise policy of selling cheese too young are the men who are producing the milk. I would like to lay special stress upon having better curing-rooms. Keep your cheese until fully cured, and then sell them every week when ready to go.

The President: I think we can fairly claim that by putting a curing room in proper, up to date shape, there can be a saving in the shrinkage of a pound of cheese a box. That would be about 3,000 pounds in the average factory, or about $300 in the first year, and all this improvement could be made for from $250 to $300 at the most. Not only would we have more cheese, but it would be of finer quality, which would command a better price, and would also create a larger demand, by still further increasing the reputation of our cheese in the old country. Cheese cured under the varying conditions of many of our curing rooms will not stand the test when shipped to the mother land. If I was going to build a factory I would have it of brick. I would make cheese in one part of it and butter in another. I would not make cheese before the first of May or after the first of November. I would put in the best maker I could find—one who had graduated from the Agricultural College or the Dairy School—paying him good wages, and I would have the best article produced that experience and knowledge could get us. A first-class building, a first class maker, and a first class article are hard to beat.

Mr. Whitton: I am, I believe, the first Canadian who made cheese in North Hastings. I am proud of the fact that I helped to lay the foundation of this great and growing industry in this county; and I am also proud of the fact that the people of this vicinity have shown by their presence and interest here that they believe the dairy business is of great importance to the county of Hastings. I have been going to cheese and butter conventions since 1872, and I can truthfully say that this caps them all. The making of cheese has been most ably discussed here. You have received valuable hints from some of the men who have addressed you to-day, among them some of the best handlers of the milk product that there are in Ontario, and that means in the Dominion. As a Hastings man I am proud to be able to say that we are making as good cheese in this county to day as can be found in Canada. The past season was one of the best that our farmers have had for a long while. You seldom hear the dairy farmer complain of hard times. However, there are some things that farmers must consider. They cannot all have whey left at their doors. They must all club together. Mr. Watkins very truly said that if we were to have fine cheese we must begin with the milk at the farm house. That milk must be sent pure, and clean and unadulterated. You must rest assured of one fact, and that is that you cannot feed turnips to dairy cows with success. Do not feed turnips to cows if you are feeding for milk. The dairy trade has been the salvation of this part of the Province, and we cannot afford to do anything that will injure the reputation of our product, and the feeding of turnips will injure the flavor of milk. I repeat it as strongly as I can. You cannot make good cheese or butter out of turnipy milk. The English consumer will not take cheese or butter that has any of that flavor.

Last spring I was invited to this town to a banquet given by the Cheese Board of Madoc, and I told them this same thing. I also said that if they would make cheese as early as April and as late as November they might just as well throw that cheese into the lake. Cheese made after the first of November or before the first of May is not worth giving away. There is no gain in it, for if it goes to the British market in May or June it injures the reputation of the really good cheese so much that down goes the price, and the net result is a greater loss than if the early cheese had never been sent at all. There appears to be a great deal of strife about the amount of milk it takes to make a pound of cheese. I have looked over the books of some of our instructors, and find that there is no great difference in the quality of the milk. Some men boast that they can make a pound of cheese from ten pounds of milk, while it takes eleven pounds in the hands of others. Mr. Publow says that it will take about eleven pounds of milk to make a pound of good cheese from milk testing about 3.6 fat. Do not expect your cheesemaker to make a pound of cheese for every ten pounds of milk. If he claims that he does he has to take it out of the patrons some way.

Mr. Kidd: I have used ice all summer, and with the same men working in the same factory we have had varying results. Our best average was 10.41 pounds of milk for a pound of cheese. But in some of our factories it takes much more than that.

Mr. Publow: This "average" question needs to be carefully thought over. The farmer who furnishes the milk has something to do with the result, and so has the maker of the cheese. I have told you that cheese made from milk taken from the same vat, which has been cooked and handled differently, one being milled fine and the other sheep-skinned, gave different results. But the better the milk is handled from the very first the more cheese can be made from it. However, I have come to the conclusion that the fault is chiefly with the producers of the milk and not with the makers. The milk received should never be in such a condition that it will have to be made into cheese too quickly.

Mr. Eager: This has been a very interesting discussion, and I would like to say a word in regard to this "average" business. Nine farmers out of ten when they get their bill from the factory look over it and say, "How much money have I got for each 100 pounds of milk?" If we wish to do things right we must start right. Things are very different in the cheese industry to-day to what they were a few years ago. The methods, the apparatus, the premises of ten or fifteen years ago are not equal to the demands of to-day in this great dairy trade. What intelligent farmer would to-day buy a mowing machine which was made ten years ago? Would he not rather say, "I must have the very latest, up-to-date machine there is in the market, to do my work in the very best manner." And so it should be in the cheese business. How are you doing your business? Are you doing it in the same old slip-shod fashion that you did fifteen years ago? If you are not, then where have you made improvements? Do you mean to tell me that there is a factory in this section that is not paying for milk according to its quality? You cannot make a fine coat out of a piece of shoddy; and you cannot make first-class cheese out of a poor quality of milk. Now, to pay for milk brought to a cheese factory by the number of pounds weight, and not by quality also, is a slip-shod way of doing business. This pooling business is not done with beef, or any other commodity of the farm except milk. If Mr. Jones and Mr. Smith each take a fat animal to the same market, one worth $25 and the other worth $45, would it be thought right for the man with the poor animal to want his neighbor to "pool" with him. We must pay for the milk according to quality, and that is according to the registered amount of butter fat. We must keep right up to date. There is a difference in the richness of milk in different cows, in different herds, and in different localities. Start right, and you are likely to be right all along the line; start wrong, and you are likely to go wrong all along the line.

A Member: I believe that a pound of cheese can be made out of ten pounds of milk, and that it can be done honestly.

The President: Do the right thing as makers and patrons and you will meet your reward both here and hereafter.

VALUABLE PRIZES FOR ESSAYS ON DAIRYING.

The SECRETARY: Through the generosity of Mr. E. G. Henderson, Manager of the Windsor Salt Co., $100 has been placed at our disposal to be given in prizes in the following manner: $50 as a prize for the best essay on Cheese-making, to be placed in my hands not later than the first day of next December. The writer of the essay must have been engaged in actual work as a cheese-maker during the season of 1900. Instructors and professors are barred. For practical butter-makers $50 will also be offered as a prize for the best essay on Butter-making, under similar conditions. The Board has decided to supplement these two valuable prizes by offering a second prize of $25 in each case. Here is a fair chance for practical men.

Upon motion of Mr. KIDD, seconded by Mr. WHITTON, a vote of thanks was tendered Mr. Henderson for his kind and generous offer.

THE BACTERIAL CONTENTS OF CHEESE IN REGULATED AND UNREGULATED CURING-ROOMS.

BY DR. W. T. CONNELL, QUEEN'S UNIVERSITY, KINGSTON.

I have had the pleasure of addressing this Association several times on bacteriological subjects in their relation to dairying, and I am pleased to see the continued and widely spreading recognition of the value of this subject in dairy work. For the bacteriologists may take to themselves some credit in the advancement of the dairy industry. They have frequently been enabled to point out the origin of taints in milk, butter and cheese, and to outline measures tending to their eradication. Taints have in many cases been traced to the entrance of contaminating bacteria or germs from such infecting source as filthy ponds, dusty stables, uncleaned udders, dirty milkers or foul factories and surroundings, conditions the reverse of cleanly, the avoidance or clearing away of which has resulted in checking the taint. As examples of such bacterial taints it has now been clearly shown by many observers that manure particles and dried manure as dust or mud is the source of taint in such conditions as foul and gassy milk, pinhole and gassy curd and "open" cheese.

Then, I have shown in one factory how a filthy gutter was the cause of seeding a factory with bacterium which produced rust like discoloration of the cheese. These are only some isolated examples of the detecting of such taints. Another way in which bacteriology has come to the front of recent years is in the preparation of pure bacterial culture starters, to replace the old and often unreliable sour milk, buttermilk or sour whey starters. Such pure culture starters are more reliable because we know what we have to begin with, and with care are assured of good results; whereas, with our milk or whey we cannot be so certain. Pure cultures are now a staple article in dairying, being prepared on a commercial scale by certain firms under the terms "lactic ferment," "lactic starter," etc., and are also furnished from the laboratories of the Agricultural College at Guelph, and can also be provided by myself on application. I might add other ways in which bacteriology has advanced the interests of dairying, but I must proceed with my subject.

During the summer of 1899 I was engaged under the direction of the Dominion Department of Agriculture, and more particularly under the direction of Prof. Robertson, our energetic Agricultural Commissioner, in examining cheese made on certain days and kept part in a curing-room with the temperature carefully regulated averaging about sixty-three degrees F., and part kept in an ordinary curing room. Two cheese each, of seven different batches were in this way examined at different intervals, and the contained bacteria were estimated quantatively, and then the species identified, a task which I must say is certainly very tedious and close. The samples were carefully taken by the cheese-maker and placed in sterile tubes according to my directions, then packed in ice and sent for examination.

My results while generally in line with those of other observers, such as Von Freudenrich, in Switzerland, Lloyd, in England, and Russell, in Wisconsin, differ in some particulars. These observers find that the bacterial contents increase rapidly for the first few days and then undergo a gradual diminution.

In the cheese I examined the bacterial contents were on the second day always very high, and, as a rule, from that period on gradually diminished; some few show an increase for some days. I find the same conditions exist in cheese manufactured in our Dairy School at Kingston this winter, *i.e*, a higher bacterial content in the cheese as taken from the press, with a gradual diminution in the days following. I can only account for this fact by saying that Canadian makers as a rule develop considerably more acid in their curd than do either the Wisconsin or the English makers. This means, of course, a greater development of those bacterial forms producing acid, and consequently their presence in such great numbers at an earlier stage than is found in English or Wisconsin cheese. Now, before tracing out the differences between the cheese kept in regulated and variable rooms, I must speak more fully of the nature of the bacteria we find in the cheese.

Without an exception in the cheese examined (whether taken from the rooms in which the temperature was regulated or non-regulated) the lactic acid bacteria make up the great bulk of the bacterial content. In fact, other species were present in such insignificant numbers that they could exert no influence in the process of cheese-curing, and in normal cheese we always find that these species soon disappear. While this rule holds good for normal cheese, it does not hold good for certain tainted or "open" cheese. In a slightly affected cheese of this latter class lately examined in the Dairy School, comparatively speaking, large numbers of gas-forming bacteria were present, but even here the lactic acid bacteria were in proportion of fifty to one. In none of the cheese I examined last summer, however, was the gas-former species present in more than insignificant numbers. The lactic acid bacteria gradually decline in numbers, usually from the first, falling down to 1,000,000 to 3,000,000 after the 60th day, some cheese showing a higher content than others. With the decline in numbers it was found that these lactic acid bacteria gradually lost their acid forming power when introduced into milk. This power could be again brought back by careful cultivation. This is of importance, for if any species had escaped destruction up to this point their growth could be no longer held in check by the lactic acid germ. This accounts for some cheese "going off" when they have previously been looked upon as first class.

We can sum up by saying that in normal Canadian cheese the bacterial content practically consists of the lactic acid bacillus—the same micro-organism we find active all through the course of cheese manufacture being the active principle of the starter—the cause of milk and cream ripening and of the breaking down of the curd allowing of the application of the hot iron test.

What are the differences, if any, between the cheese kept at a regulated temperature and those kept in the ordinary curing room? The cheese in the regulated temperature were found to have a slightly higher bacterial content and this content remained high for a longer period than in the case of the cheese kept in the variable room. Dr. Russel, of Wisconsin, in a series of examinations made in the same manner, has had the same results as I have noted with regard to the bacterial contents. I had overlooked his work till after I had made my own observations, and I am pleased to find that I can confirm him in his reports. Dr. Russel found, however, that the curing advanced somewhat more rapidly in the variable rooms, while I think observations made at Carp showed that ripening of cheese seemed to be more marked in the cheese at a regulated temperature, and as regards the commercial value of the cheese I think that almost without exception the the cheese kept in the regulated curing room were more decidedly better in body and and flavor, and hence of more value than those of the same batch kept in the ordinary curing-room. On this point Prof. Robertson will be able to give full information.

Is there any relation between the contained bacteria and the curing changes? Manifest curing changes are not seen in cheese till after some days have elapsed in the curing-room, it is during the period of decline of the bacterial contents that these changes become noteworthy. From this it is clear that the agent which causes the ripening of the cheese must either be inherent in the milk (milk enzymes of Babcock and Russel) or must be a ferment developed during the period of bacterial activity in the milk and cheese *i.e.* during the process of manufacture and the first few days after the cheese is placed in the curing-room.

Babcock and Russel, in Wisconsin, claim, and by many experiments seem to have shown, that there is present in milk as it comes from the cow a ferment which has the

power of digesting casein in time, and they claim that it is to this inherent enzyme we must look for the active agent in cheese-curing. The flavor depends partly upon its action, but mainly upon the products of bacterial activity in the cheese. There are some fallacies in their otherwise excellent work which I will not point out here.

If the statement made in German *Milch Zeitung* is correct, viz , that cheese can be perfectly made and ripened from milk that has been pasteurized at a temperature of 185° F. for ten minutes by the addition to the milk of measured quantities of calcium chloride and a starter, then their enzyme theory is entirely upset; for this enzyme would be destroyed at this temperature so that its action would be excluded. This statement, however, in the *Milch Zeitung* yet lacks confirmation, and we will have to accept it with great caution. I have not yet given up the idea that the curing process depends upon the lactic acid bacteria, though I know nothing of any casein-digesting enzyme which this bacillus forms. Lloyd, of England, thinks the change can be explained by the action of these bacteria on the lime and salts, and consequent chemical interaction.

It is certain that we must first have more accurate chemical knowledge of the changes which do occur in the process of cheese ripening before we can make positive advances. The bacteriologist has gone about as far as he can advance along these lines till the chemist comes to his aid.

Now, while it is not of general importance to know the exact mode and method of the curing changes, it is of importance to the practical man to be made acquainted with the results of experiments, particularly as it may and has led to beneficial commercial results. To the experimentalist it is of importance to know upon what the curing process actually depends, for he can then more scientifically work to bring about results of practical value.

To sum up generally the results of my work and that of others on the bacterial content and curing of cheese are as follows :—

1. Normally in cheese the greatest bacterial content is found in from one to four days old cheese. At this period as high as 500,000,000 bacteria may be present per gramme of cheese.

2. Following this period we have a gradual and continuous decline in the number of bacteria in the cheese.

3. The bacterial content remains high longer and the decline is more gradual in the cheese kept at the regulated room temperature (63 degrees, F.).

4. Lactic acid bacteria are practically the only bacteria found in normal cheddar cheese during curing. In all cheese gas-producing bacteria have been demonstrated, but in insignificant numbers. These gas-producing and allied forms are present in larger numbers in tainted and open cheese.

5. In the cheese examined the gas-producing and "allied" "foreign" bacteria have not been more common than in the cheese at the regulated room temperature; they were nor present and hence did not multiply. Certain it is that in cheese in the variable room, as the lactic acid bacteria more rapidly decline, any foreign species present would more rapidly have a possible chance for development, and hence cheese in the variable room ought to go "off" more commonly and earlier than those in the room kept at 63 degrees, F.

6. We are still unaware of the exact rationale of the curing process. It is quite certain, however, that the curing agent is either inherent in the milk (milk enzymes "galactase" of Babcock and Russel), or is formed during the process of cheese manufacture and in a few days immediately following the placing of cheese in the curing room.

7. That commercially, cheese made under the same conditions, but cured at a temperature regulated between 60 and 65 degrees, F. (average 63) is more valuable than that allowed to cure in a temperature more variable. Further, it keeps better, another factor of importance commercially.

PRODUCTION OF PORK FROM DAIRY BY-PRODUCTS.

By J. H. Grisdale, Agriculturist Central Experimental Farm,. Ottawa.

The subject upon which I have been requested to speak is the value of such by-products of the dairy as skim-milk and whey in the production of pork. Some skim-milk may not be good for feeding hogs, and some whey may not be good. But if it be kept in a normal condition there is no more valuable food for a young hog than skim-milk. All of our live stock pass their early days on milk. It is a natural food, and for that reason it is difficult to wean young pigs without the use of considerable milk. Where we have succeeded in weaning pigs without milk they are always of an inferior stamp, for even in subsequent days they do not seem to pick up. Whey is also of considerable importance along this line, but it is not nearly of so much value in feeding young pigs as is skim-milk. The main reason is that a good deal of the albuminoids, or flesh-forming material, has been extracted. And not only that, but the skim-milk appears to have a tonic or exhilarating effect, and seems to have a stimulating effect on the growth of pigs. It does not depend so much upon the quantity of this milk that you have given them as upon the fact that you are feeding it. The value of whey for fattening pigs was brought out to-day by the President, when he recommended the plan of having the hogs kept near the factory, and have the whey given to them when fresh and sweet. This is one of the best ways of raising pork cheaply, but there is also the danger of giving the cheese a bad flavor on account of the piggery contaminating the air around the factory. This might be obviated by keeping the hogs about a hundred yards or more from the factory, or as far away as is convenient. Whey fed along with pasture makes pork that may be said to be of fair quality. Certainly it is a cheap method of raising pork. I know of one man in the neighborhood of Ottawa whose farm comes right up to the factory, and last summer he fed twenty pigs about 100 yards away from the factory. He carried the whey over to the pigs, and there fed it to them. He had about two acres for the twenty pigs. There was a little Dutch clover in the field. The pigs had considerable grass, and they had a nice place to lie down in. At the end of the factory season he found it was necessary to feed only two bushels to each pig in fininishing off. He found that he had made a clear profit of five dollars on each animal, or $100 on the twenty hogs. You will see, therefore, the great value of whey in supplementing pasture. In the summer there was practically nothing but the whey and pasture. If you have to take whey home I would advise you to take it in a barrel and not in a milk can. As to feeding skim-milk, I may say that in sections where butter-making is the industry rather than cheese-making, the skim-milk can be handled even better than the whey, and it is worth about twice as much pound for pound as whey. But remember that although whey looks thin and watery it contains a good deal of nutriment. There is all the milk sugar and a large percentage of the albuminoids. We have been pursuing a number of investigations as to the value of whey in fattening hogs at the Experimental Farm, and have tabulated the results. Skim-milk we found was worth about half as much as corn, pound for pound. We found in these experiments that when pigs were fed meal alone that 4 27 lbs. were required to make a lb. of gain; but when meal and skim-milk were fed—all the milk they would take and only half the meal fed formerly—that only 1.26 lbs. of meal were required for a pound of gain, with 25.39 lbs. of milk. One pound of meal would thus be worth 8.43 lbs. milk.

A mixture of peas, wheat and rye produced 1 lb. of pork for each 3.43 lbs. fed. When fed with all the skim-milk it was found that 2.17 lbs. of this meal were never needed, and 11.10 lbs. of milk, for each pound of increase, or 8.82 lbs. of skim-milk to 1 of meal.

The experiments also showed that about 1.83 lbs. of skimmilk were the equivalent of a pound of corn. This would seem as if skimmilk has the most marked effect when used with corn.

We found too that when barley was fed alone it took 4.35 lbs. for each pound of grain made, while only 3.64 lbs. were required when fed with 2.52 lbs. of milk.

The use of milk with a mixture of peas, barley and rye fed whole bears the relation of 6.99 of milk to 1 lb. of the grain.

A meal composed of equal parts of ground peas, barley and rye was fed in one case without skim-milk, when it was found that 4 36 lbs. were required for a pound of pork, and in another case when all the milk the pigs would consume was fed with a similar ration of meal it required 3.46 lbs of meal and 4.81 of milk to make a pound of pork. According to this experiment skim-milk would be worth about one-fifth of an equal part of the meal.

From these experiments we learned that skim-milk may form the largest part of the food of young and growing pigs with advantage, while for the fattening of hogs weighing over 100 lbs. it is economical to give only an allowance of skim-milk—say not exceeding 5 lbs. a day. We found in practically every case that the swine which had skim-milk as a part of their ration were healthier and more vigorous than those which had grain without the skim-milk. Skim-milk, I should say, may be considered as worth from one-sixth to one-fifth as much as mixed grain, and gives the best returns when it constitutes a comparatively small share of the total food—perhaps about 3 lbs. a day would be about the average. Of course we gave them water besides. We keep water before our hogs all the time, in a trough, and put the grain before them as they require. It is well to have the grain ground, especially barley.

A Member: Can you give us any idea of the relative feeding values of sweet and sour whey?

Mr. Grisdale: I cannot from my own experience, but I remember that at Guelph Prof. Day carried on an experiment with sweet and sour whey and skim-milk at the same time, testing their value as pork producers not for quantity so much as for quality. He informed we subsequently that the sour skim-milk and sour whey fed to hogs gave them better results than that which was fed sweet. I know that the sour whey did not smell nice, and the skim-milk was curdled.

Mr. Payne: It stands to reason that if the milk sugar is fermented it must be injured as a food factor.

Mr. Grisdale: I know that some of the milk sugar will be turned into alcohol, and may thus affect its feeding quality.

The President: A friend of mine once said that it was nice to have a pickle occasionally as a relish for the appetite, but that it was not wise to try and live upon it.

Mr. Honey: We hear a good deal about hogs for making export bacon. Do you think that skim-milk and corn, or pasture and whey alone, are suitable food for making first-class bacon for export? If pigs are fed grain carefully and allowed to run around in the pen there will not be much waste of food. If the chop is damped a little do you not think it would be better?

Mr. Grisdale: Would corn and milk alone make first-class bacon? That is an important question. We fed 160 pigs along this very line, and the results seemed to indicate that corn and milk together are good flesh formers; but if they were fed too much and got too fat the packers would not like the bacon so well. The chief objection to feeding corn with milk is the tendency to put on too much fat. Profs. Day and Robertson have also found this tendency towards fat when fed too long on this diet. There is a tendency towards softness if finished off on pasture and whey, and to avoid this towards the end of the season they should get some peas and oats to get them hardened in flesh. Under such circumstances I think either of the plans of early feeding will give good results. If the pig has been fed all summer on flesh forming foods it is easy to finish him off later.

The President: The question of damping grain reminds me of Theodore Lewis' answer to the farmer who questioned that wise old German's advice as to feeding grain and meal dry. "It will take too much time for the pigs to eat the dry food," said the objector. Mr. Lewis looked at the other, and quietly said: "Mine friend, vot vas that hog's time worth?" (Laughter).

Mr. Honey: We cannot go to any place in the country now where farmers assemble without getting this question asked about the hog. The cow and the hog must be produced together. We must select the typical hog, and then feed the animal right. If we feed all one kind of food too long at a time, such as skim-milk and corn, the pork will be too fat and soft, and packers do not want too much grease. That sort of bacon does not suit Englishmen. It does not pay to raise fat; flesh is what is needed. I would say to you that it is best to feed your pigs well. I do not think it is best to put a young pig on

pasture and give it practically nothing else but milk, and then finish off with grain. I would mix a little grain with the pasture and skim-milk right along. I would not lard at the last, but would lard all along. There are six weeks in the young pig's life that requires a lot of skill, and that is the period from the sixth to the twelfth week of its age. If a pig is stunted at that period he will be a poor thing no matter what subsequent treatment he may receive, and I would not take home a cart-load of them as a gift. Grow the pig; stretch him out; give him bone and muscle in that second six weeks of his life, and you have something to build on. Now, we want to avoid getting the soft, greasy bacon hog. You know that at London at the Fat Stock Show you would see the bacon experts go and handle the pig from one end to the other, and they wanted it to be solid, and to have even fat and lean all the way through. I agree with Mr. Grisdale that there is nothing to equal skim-milk for young pigs, but you must give them some-else to harden them up. Of the grains, give shorts and barley to young pigs, but do not give corn, rye or wheat to very young animals. The pig wants a mixture in its food. He must have a balanced ration. Who among us would like to eat all potatoes at one meal and all fat pork at the next? We should deal with the pig in an intelligent manner.

A MEMBER: How do you feed in the winter?

Mr. HONEY: I give them a little meal and shorts, and barley ground very fine. I like the pigs in winter to have a mixture of some roots once a day with the grain. In the summer they do well with clover, but in winter they cannot get the green feed. For young pigs I would have the roots pulped and mixed with shorts and barley meal. I never give the meal dry, for I find that if the meal is put in dry there will be a good deal of waste. I do not think it is profitable to keep a pig in a pen that will freeze. I think it pays to dampen the feed of young hogs, as they would be likely to waste some if the grains are left dry. Do not in any case make the food sloppy; dampen it only a little. I have eighteen pigs in one building at the present time. I take a fifteen quart pail of skim-milk, and after I put in their chop I add that fifteen quarts of milk among the lot. That will not wet it very much, but will get it nicely damped. Then after they have fairly cleaned the trough I may give them some skim-milk or water to drink. I would never give a pig more than he would eat, so that he would leave some of his food in the trough.

A MEMBER: Does your pig feed ever freeze in winter?

Mr. HONEY: It must be a pretty cold pen where the food will freeze before a hog can get his dinner. (Laughter).

A MEMBER: Would it pay to cook potatoes for small pigs?

Mr. HONEY: Small potatoes not fit for sale are good for young pigs.

A MEMBER: Do you think it is best to keep a pig through the winter?

Mr. HONEY: No. I do not think it is wise to winter a pig if you can help it.

The PRESIDENT: Do not keep a pig over winter if you think he can get through the same hole in the spring that he squeezed through in the fall. (Laughter).

Mr. Honey: That reminds me of the Irishman who had a pig of that sort, and he declared that the creature drank a pail full of swill and then was able to get into the pail he had emptied. (Laughter) Seriously do not crowd a pig too much. A pig six months old should weigh from 175 to 200 lbs. Too much weight at that age means an increase of quantity at the expense of quality. A hog should make about a pound a day of gain for the first six months.

A MEMBER: How many pounds of whey a day would you advise for a pig weighing about 100 lbs.

Mr. HONEY: It would all depend on what you would give with it, and whether the whey was sweet. I believe the whey is worth double when sweet to what it is when five days old. A fifteen-quart pail of whey—that is about thirty pounds—would be sufficient for about seven pigs about three times a day. In our part of the country we do not allow patrons to draw the whey home in their milk cans. They haul a load of whey home once a week. I repeat my opinion that whey fed within twenty-four hours after being drawn is worth double the value of whey four or five days old.

Mr. EDGAR: Are potatoes good food for a bacon hog?

Mr. HONEY: No; not to finish on.

A MEMBER: What class of hog is best to buy for bacon?

Mr. HONEY: Buy the breed that you like best, as you will take best care of them.

There is a bacon type of a hog, and in all the breeds you can get something near the right form by selection. I am afraid that if I state my own preference of breed some of you will jump on me. However, I keep improved Yorkshires, and the very best and longest type I can get. I get them fit for the market in six months, and they make good bacon.

OUR PROVINCE AND OUR PEOPLE.

An address upon the above named subject was delivered by Mr. C. C. James, Deputy Minister of Agriculture, which dealt with quality of the early immigration into Ontario, and in which the speaker paid a high tribute to the courage and character of the settlers who opened up the country. He predicted that large population would yet be seen in the now sparsely settled northern districts of the Province, as well as the immense immigration that was certain to pour into the Canadian Northwest generally.

CANADA'S GREAT POSSIBILITIES.

By J. W. Johnson, Mayor, Belleville.

After apologizing for the absence of Sir Mackenzie Bowell, who was suffering from sore throat and could not be present to deliver an address, the speaker said that he had been asked by Sir Mackenzie to represent him, and speak upon the present outlook in Canada. One of the most remarkable things in connection with the progress of Canada was the growth of the dairy export, which has increased from $1,600,000 in 1871 to about $20,000,000 in 1899. In fact Canada sent into the British markets about sixty per cent. of the cheese imported into that country. The reason we had made that great progress in our cheese trade was that our farmers as a class were honest. They may not be more honest than the dairymen of the United States, but we have a bigger policeman to attend to the dairyman if he does not do what is right. Skim-milk and prayers do not go well together, and the work of the instructors and inspectors has done much to show that it is not only right, but that it is also wise, to do the honest thing in handling milk.

The cheese and butter trade, like that of other industries, is helped or hindered by transportation facilities. It is a fact that Canada stands to-day as one of the great maritime countries of the world. Great Britain comes first, and Canada comes sixth. There is a great fight between this country and the United States as to which country shall control the transportation of this continent, and I believe Canada will win. We have spent $55,000,000 in making the route from the great lakes to the sea as perfect as can be made. We have now a splendid water way of about 3,000 miles from the Straits of Belle Isle to Port Arthur. This has been accomplished by a great sacrifice on the part of the people of Canada. There is no country that has shown more enterprise than Canada in the way of pushing along the construction of canals and railways. (Applause.) When Governor Roosevelt, of New York, a short time ago sent his commission to enquire into our canal system, they were surprised, and so were some of our own people, to find that $55,000,000 had been spent in building canals in Canada, or $10 per capita. If the United States had been as enterprising in proportion to their population they would have spent $800,000,000 in canals alone. We have now at least fourteen feet of water from Lake Superior to Montreal, with the completion of the Soulanges canal. I believe that the Conners Syndicate, which is coming to Montreal to do what that place cannot do or has not done for itself in the way of building elevators, is one of the best things that has ever been developed for the prosperity of that city, and it will also be of great benefit to the Dominion at large. All the grain that now goes to Montreal from the Northwest is a mere bagatelle compared with that which goes through Buffalo to the seaboard. Is it not far better for us to give that syndicate certain rights and privileges to perform their special task, and to see something done within this generation, than to let the occasion slip and see scarcely any progress made? For no other organization seems able to do what the Conners Syndicate offer to accomplish. And so I say that the Harbor

Commissioners of Montreal and the Dominion Government have been perfectly justified in making the agreement with the Conner's Syndicate. The scheme means the incoming of more vessels to the harbor of Montreal, and the result will be the cheapening of freight for you and for me. I believe that Canada's trade will grow beyond what anyone here can conceive.

In addition to the magnificent waterway comprised in the great lakes, the St. Lawrence river and the canals, we have been improving our railway system, until now it is the finest and the largest in the world in proportion to our population. In 1867, at the time of Confederation, we had 2,250 miles of railway, but the energy of our people has increased this to 16,000 miles in the thirty years or so intervening. We have the great Intercolonial road, connecting the Maritime Provinces with the Upper Provinces, the Grand Trunk, which so well serves the central portion of Canada, and the Canadian Pacific Railway, which is one of the grand highways of the Empire. It has 3,836 miles, and has cost about $107,000,000. We have been sorry to see so many of our bone and sinew leaving for the United States, but, after all, transplanting is a good thing. It is necessary that some of our sons should go to other countries to learn and to develop, and return with ripe experience. We cannot keep all our youth in our own towns. But now that our western railways are opening up our north-west, we find that Canadians are returning and occupying our lands there, and many Americans are coming too. This is the result of our enterprise in the years gone by.

When you put your cheese or butter on a steamship you get your bill of lading signed, and you insure that cheese or butter. But beyond the insurance against fire and the danger of the elements connected with navigation, there is further danger of attack by "the Queen's enemies," as the bill of lading says. However, we have the Queen's navy. That insurance is one of the best afforded our trade, and the people of the old country have been paying for it all. I think the time has come when Canada should do her full duty by paying a fair share of that insurance. Many of us cannot at present go and fight for the Empire, now carrying on a war in South Africa, but some of our boys have gone, and I think that Canada's duty is to pay the whole of the bill incurred in sending the Canadian contingent there. The time has come when we must face the fact that we are an integral part of the great British Empire—that our future is within the folds of the Union Jack. We are not sponges and we must pay our share of the cost of Empire, as well as share its honors and advantages. When we were boys in the past our parent paid the cost of protection. But are Canada and Australia in the position of boys any longer? Canada is the best part of the British Empire. It is a country worth living in, and it is a country worth dying for. (Applause).

LESSONS FROM THE VERMONT DAIRY CONVENTION.

By Prof. H. H. Dean, Ontario Agricultural College, Guelph.

I am on the programme for an address to-morrow, and I have just returned from a long journey to the Convention of a sister Association in Vermont, and feel rather weary; yet it is like a tonic to see before me a number of my old students, and I therefore cannot resist the feeling that I should accept the kind invitation of your President and give you an impromptu address this evening. The Vermont Dairy Association has been holding its annual meeting at Brattleboro' this week, and I was there on invitation. It does us good sometimes to go and see what our neighbors are doing. It is necessary to get out of ruts in our work, and these conventions—provincial and state, national and international as it were—help to knock off the rusty spots of our mental machinery. The State of Vermont joins Canada at the Province of Quebec, and yet the people there know comparatively little about us. They have an idea that we do not do very much over here outside of cheese-making. The chairman of that convention said that he would like to have Canada annexed, and become a part of the United States. They thought we would be a small fraction of their territory, but for a few minutes I endeavored to disabuse their minds of that idea. When I told them of the immense stretch of territory comprising Canada, and how it dwarfed even their great republic, it opened their eyes. I also told them that our national song was yet full of loyalty to the Queen.

In going over the State it struck me that Vermont was rather bare and uninviting so far as the land was concerned, yet I found that on these Vermont farms they had from 100 to 200 cows. At St. Albans, Vt., they have the largest creamery in the word. They are getting high ideals of the diary cow over there, for it is the general opinion that no cow should be kept for butter-making whose milk tests less than four per cent. of butter-fat, as she would be unprofitable. Most of those who spoke of the quality of their herds claimed that their cows gave 5 per cent. of butter-fat, and that they got from 300 to 500 pounds of butter per cow. One man said that if he was asked to describe an ideal milk cow he would say, " She should have an Ayrshire body with Jersey characteristics." A man present asked me the price of good Ayrshire cows over here. They want to get the vitality, stamina and quick movement of the Ayrshire, that will forage among the hills, and if with that they can get some of the rich milking quality of the Jersey they have just the kind of milch cow that is required. The most of the farmers at the Vermont convention were in favor of silage. However one man objected to silage because it smelt like whiskey—Vermont is a temperance State. (Laughter). He also thought that corn ensilage was responsible for the introduction of tuberculosis in that State. I do not agree with the idea that ensilage has anything to do with tuberculosis. The past season was a dry parching one over in Vermont, just as it was with us in western Ontario. One speaker remarked that there were three things of which one can be reasonably sure: death, taxes and a summer drouth. It was impossible to dodge the first two, but by having a silo filled with corn it was possible to overcome the effects of a summer drouth. In our own case at the Agricultural College, by feeding corn ensilage and about six or eight pounds of meal we found that we were able to overcome the summer drouth. Our dairy cows were producing a large amount of milk under these circumstances, while our neighbors just near the college were finding that their milk supply had fallen off greatly. Have a good, large summer silo, and by taking off a few inches every day you can keep the silage from spoiling, and thus maintain the supply of milk during the dry season.

Another point brought very strong at the Brattleboro' convention was the matter of butter-fat registration. The State of Vermont has passed a law requiring every person who operates a creamery to have a license before they can use a Babcock tester. About 259 operators had to try for a license, and about thirty per cent. were proved to be wholly incapable of handling the Babcock tester. If we are going to use this test to any extent we must have a Provincial law passed that will require the operators to have a license after an examination. Each person wishing to apply for a license must deposit a dollar with the College. If he does not want to go to the College, six samples are sent to him from milk already tested at the College, and he must test that milk in the presence of some responsible person, and both must testify that the test was properly performed. They go further than that in Vermont. Every piece of glass connected with the Babcock tester must be examined by a state official and endorsed by him. A charge of five cents is made for each article or part of the apparatus which is tested. I learn that many pipettes have been rejected as a result of this official test. Now, I think that something of that kind could and should be done in Ontario.

I found that those Vermont dairymen have reached that stage where they can show how much milk each cow in their herd is giving and how much it costs to feed her. They are managing the whole business on a dollar and cent line. I found men there who could give me the profits they were making on each individual cow. We must study this, too, if we are to keep in the front rank. Every effort is being made over there to make the best possible exhibit of agricultural products at the Paris Exposition. They feel quite keenly the fact that Canada won the most prizes in these lines at the World's Fair at Chicago, and they are bound to retrieve themselves. But I trust that we will again succeed in our competition with them, but we shall have to put forth every effort in order to do so this time.

I was much struck with the fact that the women of Vermont take a very active interest in the work of the Dairy Association. In fact they have a Woman's Auxiliary in connection with the general organization. One of the meetings of the Association was conducted by the ladies, and a lady occupied the chair, although some gentlemen also spoke. That meeting was thrown open for questions, and one of the questions propounded by a woman was : " If you had a cranky husband, who was always getting out of temper, what kind of ration should he receive?" The reply was : " I would not give him any pie,

or doughnuts, or anything that is likely to interfere with his digestion." (Laughter.) The food that a man eats must have a very important influence upon his temper and character, and indeed in every way.

The State Superintendent of Education gave a very interesting address upon "Life on the Farm," in which he drew a very pleasant picture indeed. He showed that it was possible for life upon the farm to be enjoyable and wholesome in every respect. Gov. Hoard was there, and was as full of wit and wisdom as ever.

I was greatly touched with the sympathy manifested by those present at that gathering in Vermont when an allusion was made to our Canadian boys going to South Africa. They actually cheered our boys. (Applause).

REPORT OF INSTRUCTOR BENSLEY.

I take pleasure in herewith submitting my report of work done as one of your instructors and inspectors for the season of 1899.

I commenced work on May 8th and finished October 27th. Of this time I spent 127 days in factories, testing milk and giving instructions in cheese-making, three days attending cheese boards, four days settling milk cases, eight travelling and five days detained on account of rain. The number of factories visited was 78.

I tested about 5,700 samples of milk, and of that number I found but 13 wrong, all of which admitted and paid the fine imposed on them. The amount contributed by factory men for my services was $355, amount of fines $170, only half of which goes to Association, making a total of $440. I am pleased to say I found a marked improvement in the style and finish of the cheese in most of my section, but there are still cheese makers who are very careless with there work in every respect, and it is among this class of makers where most of the trouble is.

The principal fault with cheese this season was weakness in body, caused principally from makers ripening their milk too much and not giving their curd time to cook. It is astonishing how makers will persist in this kind of thing when they know what the results will be. Year after year you will find makers who are having their cheese rejected from this very cause and still it seems to be no warning.

G. H. Bensley.

REPORT OF INSTRUCTOR HOWEY.

I have much pleasure in submitting this my fifth annual report as instructor and inspector of this Association for what is known as the Belleville section. I visited fifty-five factories. In accomplishing this work I spent 149 days in the employ of the Association. 137 days were spent in testing milk and giving instructions; the remaining time was spent in travelling, attending Boards of Trade, and settling milk cases.

The amount of money contributed from factories for my services is $260; total amount of money received as settlements from patrons delivering deteriorated milk, $610 making a total to the Association, $565.

In regard to the quality of cheese in my section there has been an improvement, although the cheese maker is handicapped to a certain degree with poor buildings. I see by some of the instructors reports that the buildings in their sections are fair. I wish I could say this in regard to my section. I can say that there are not one half dozen factories in which I would submit myself to manufacture first-class cheese in, because the temperature rises and falls with the sun as high as in the nineties.

I might say I think it is time we had better factories, better shipping facilities, and not these old box cars that carry a temperature of a hundred degrees and over throughout their whole journey. Refrigerator cars in hot weather and ventilated cars in cooler weather are absolutely necessary. If cheese makers will still persist in binding themselves to make good the loss which occurs from causes over which they have no control, just that long we will be without these improvements. I believe, however that in Canada we can have these improvements so constructed that we can get a prime quality of June, July and August cheese.

H. Howey.

REPORT OF INSTRUCTOR WARD.

I now present my second annual report of work done for Cheese and Butter Association of Eastern Ontario. The territory allotted me was Peterboro' and Lindsay sections. The number of days spent in employment of Association was 170. Of this time 149 days were spent in testing milk and instructing, seven days in driving and calling, fourteen days on milk cases and travelling.

Of the ninety-one cases of deteriorated milk I settled forty-seven, settled by court, six, and balance were settled by management of factories. The amount of money received to be paid into the funds of the Association is as follows: from fines, $415.34; from factories, $365; total, $780.34.

Late delivery of milk in morning I consider a serious trouble in some of the section I travelled over. It should be remedied as far as possible.

Return of whey in milk cans under existing circumstances, I believe, should be abandoned.

There are factories in my sections that pay for milk by quality and are giving good satisfaction. The feeling in that direction seems to be growing, and I would say let it become general as soon as possible, if it will stop fraud in the delivery of milk, for we must have pure milk, delivered in good condition, if our cheese are to advance in quality, which should be the aim of both producer and maker.

Seeing the gross ignorance of the law in regard to the delivery of milk, has forced on me an idea that there should be a copy of the law in pamphlet form placed in the hands of every patron of this country.

Another difficulty which I think threatens the dairying business of this country is the strong competition among makers, which is putting the price too low for manufacture. I think I can tell as soon as I get into a factory whether the maker is properly paid or not. Where he is as a rule everything is right, a proper interest taken in the work, and things in much better shape.

On the whole I found a decided improvement in curing-rooms and equipments over last year. A few of the makers still run their milk too fast and over handle their curd, which means loss on both quality and quantity, but as a whole I found makers careful and anxious to arrive at the best result.

I cannot close this report without referring to the great mistake which is being made by putting in too many butter plants too close together. The result is, there is not sufficient business to be profitable on capital invested.

Quality of cheese as a rule has been good; very tidy and neatly put up in most of my factories. But right here I would like to urge makers as far as possible to attend a dairy school.

This season which has just closed has been a good one for the producer, and I hope may prove to be a profitable one for the buyer and shipper, for their interests are mutual.

In conclusion I would like to urge makers to be careful about receiving milk, for where we find a careful maker in this respect the result is plainly noticeable.

R. W. WARD.

REPORT OF INSTRUCTOR PURVIS.

I commenced work on the 18th of April, and quit work on the 5th of December, working steadily from the 28th April till the 5th November, after which I was not fully occupied. Of the 182 days spent in your employ I spent 167 in factories giving practical instructions in cheese making and testing milk; 3 attending court, prosecuting parties accused of tampering with milk; 5 in driving; 6 detained on account of rain; and one in Montreal examining cheese.

During the season I caught 22 parties tampering with milk; 6 of these refused to settle, and I had them brought before a magistrate and fined. The balance settled either with myself or with the managers of the factories where the wrong was committed.

The amount contributed by the factory men for my services was $618.00, and the amount collected from fines and settlements was $241.

This is a better showing than ever before, and I think it proves that the patrons are learning to fear the consequences of sending adulterated milk to cheese factories.

The make of cheese was never of so high a grade before in this district, and a great deal of credit is due both the makers and patrons for the eager way in which they are trying to improve. Another improvement I wish to note is that of the new factories built since my last report. A large number of new, well equipped factories have been built during the last year, and no less than fifteen of these have been fitted up for both cheese and butter.

I wish to express my thanks to the makers and managers throughout my district with whom I did business, for the uniformly kind way in which they treated me and assisted me in the discharge of my duties, and I am sorry that I could not visit all who applied for my services, as I had to refuse upwards of forty applications, not having time to go to all.

A. P. Purvis.

REPORT OF INSTRUCTOR ZUFELT.

I have the honor of handing you this, my third report as instructor for this Association. The number of factories visited officially was 53. Altogether I spent 155 days on the road as follows: 127 days working in factories; 15 driving; 6 attending fines and cheese boards; 7 lost on account of rain.

The amount of money received for the Association was: Fees from factories \$441.50; ½ fines (\$460) \$230, total \$671.50.

As the work of an instructor is much the same from year to year it is scarcely necessary to repeat what has already been given in previous reports. Suffice it to say that I have endeavored to assist the makers in what difficulties they have met with and help them improve the quality of their cheese, and think I can say I have been fairly successful.

L. A. Zufelt.

REPORT OF INSTRUCTOR LOWERY.

I have the honor of presenting to you my second annual report as inspector and instructor for this Association. The district allotted to me was Campbellford, Madoc, Stirling and Brighton. I visited 76 factories.

In accomplishing this work I spent 164 days in the employ of the Association, as follows: Three days lost on account of rain, seven days driving and calling at factories, and one hundred and fifty-four days in actual work at factories, giving instructions and testing milk.

Of the 8,518 samples of milk tested with the Quevenne lactometer, and 4,282 with the Babcock tester, thirty eight were found to have been tampered with, and were fined \$683. The amount contributed by factories for my services was \$370, and from fines \$341.50; netted the Association \$711.50. I had less trouble this season than I had two years ago in the same district with parties tampering with their milk, which goes to show the benefit of the Babcock tester.

It gives me much pleasure to report favorably on the quality of cheese made in the majority of factories in my district; but I am sorry to state that late in the season I found the quality not so good, on account of feeding turnips. In one particular factory the where the milk all seemed to be flavored with turnips, I spoke to one of the patrons about it, and he simply told me that they might as well close the factory if they had to quit feeding turnips. I contend that it is impossible for any make good flavored cheese from such milk. But the trouble is in getting first-class milk to our cheese factories, and I think more attention should be given to the farmer who produces the milk. One thing I would like to impress upon the Association is to try and reach the farmer, and instruct him more in caring for his milk, as that is the foundation for making fine cheese. I noticed in traveling through the district a number of hog pens under the milk

stands, and I am sure milk could not have a good flavor standing all night over a hog pen. If all milk sent to cheese factories was better cared for, we would have more cheese and a better quality for the same amount of milk.

The general conditions of the factories was fair, with the exception of a few of which were not fit to make or cure cheese in, and the temperature in the curing-room in hot weather was just as high as it was out doors. It is a very important point to have a good, cool curing-room to cure cheese after they are made. The trouble in making cheese that have to be cured at such a high temperature is that they are too dry for the English market. But I must say just here that Madoc has very few of the style of factories I have just described.

In conclusion, I found the makers doing very good work, with the exception of a few who fail to make the most of what is at their disposal, and do not seem to understand that cleanliness is essential in making fine cheese.

J. B. Lowery.

REPORT OF INSTRUCTOR PUBLOW.

I have the honor of handing you my twelfth report as instructor and inspector for the Cheese and Butter Association of Eastern Ontario, for the season of 1899,

I commenced work on April 25th, and ended Nov. 6th, working in all 169 days. Of this time, I spent 130 days giving instructions in cheese-making, testing milk and visiting factories; 4 days in settling milk cases; 5 days attending Cheese Boards; 20 travelling to factories; 2 attending exhibitions, and 8 detained on account of rain.

The number of factories visited was 94. Of this number 72 received official visits.

Out of 7,150 samples of milk tested, sixty-one were found to be deteriorated; fifty-five of those had fines imposed on them, ranging from $10 to $50 each, amounting in all to $1,270. Four were not fined, giving satisfactory explanation that the deterioration was accidental, and paying for the lost time in making investigations, and two are not settled. The parties have acknowledged their guilt, but have asked for an extension of time to pay their fine.

Out of the amount received from fines $130 was paid for solicitor's fees, leaving $1,140 to be equally divided between the factorymen and the Association The amount contributed by factorymen for my services was $500, which with the amount from fines $670, makes a total to the Association of $1,070.

I am pleased to report a marked improvement in the quality of the cheese. While some of the factories did not always turn out good cheese, I had fewer complaints of rejections than any previous year. I found some factorymen adopting a very dangerous practice, that of shipping their cheese too green. I found on several occasions that the cheese had been shipped to within two days of the hoops. I believe this was largely due to parties wishing to receive the high price that was prevailing at the time, and I believe if factorymen persist in shipping their cheese too green, it will go a long way to injure the reputation of the Canadian cheese.

I am pleased to report a marked improvement in the curing rooms of quite a few factories that I visited this year. They have had their walls and floors thickened, and have provided good ventilation and arranged ice-racks for controlling the temperature, for which they have been well repaid by a marked improvement in the quality of their cheese.

This report I have confined to the work actually done, but I shall be pleased to give any further information if required.

G. G. Publow.

The President: If a factory is not in good condition, call a meeting of the patrons, and point out to them in a friendly way where the danger lies, and how their financial interests are affected.

Mr. Lowery: I found in a certain district some fault with the cheese, and pointed it out to the officers of that particular factory. The president of that factory asked me

to come back that week and give the patrons a talk on the care of milk. I see that gentleman here, and I would like him to tell you if there were any better results as the outcome of that meeting.

Mr. English: I can assure you that Mr. Lowery's visit and talk had a good result. Nearly all our patrons attended that meeting. I can recommend such meetings.

The President: Any man who will feed turnips to cows furnishing milk to cheese factories ought to be prosecuted. In fact turnips will spoil the milk both for cheese and butter making.

A Member: Do mangels and sugar beets injure the flavor of milk?

The President: No. But it pays better to feed corn.

Mr. Dargavel: There are cases where a farmer can grow roots better than he can raise corn.

The President: If you can feed carrots, mangels or beets better than corn do so, but do not use turnips for milch cows. Butter and cheese depend so much upon flavor. In judging butter at least 45 points in 100 are given for flavor alone. Do not allow some "sucker" away back in the country to put you in for loss just because he will persist in feeding turnips. (Applause.)

Mr. Payne: Can a man be punished by law for sending turnipy milk to a cheese factory?

The President: He cannot be. But I think he ought to be.

Mr. Whitton: I believe that milk with a turnipy flavor should come under the head of impure milk.

The President: And so do I. I believe there there ought to be Act passed fining a man for sending turnipy milk to a cheese factory or a creamery. We must do something with these people, or the reputation of our dairy goods will suffer.

Mr. Publow: I think the turnipy flavor may be very easily overcome without prosecuting anybody. We have a lot of Scotchmen in Lanark.

The President: And Scotchmen and turnips go together.

Mr. Publow: It would look like it. I warned them every year against feeding turnips. But one maker notified his patrons that they might feed turnips. The next year they paid a "dock" on their cheese. In that factory they have since made it a rule that if it can be proven that any patron feeds turnips to his cows such patron or patrons will have to pay for the dock. In other words, the men who feed the turnips must pay for the whole loss. In disposing of the fines made through my prosecutions as inspector, one half goes to the Association and the other half to the local factory. We have arranged with a solicitor to take each case at $5, whether there is a fine or a settlement. I find that it is the best thing to have the matter attended to without taking up too much of my time.

Mr. Dargavel: We have a number of inspectors employed by the Association, and it appears from the reports that Mr. Publow has collected a large proportion of the fines inflicted upon patrons who has been tampering with milk. Now, I would not like this meeting to run away with the idea that the people of our district, of which he is inspector, are more dishonest than those of other sections. I think the reason is that Mr. Publow has a greater faculty for picking out the offenders and convicting them than the other inspectors have. We are paying our inspectors large salaries, but will see that we are getting good work from them. I think the idea of employing a solicitor is a good one. I notice that in some of the inspectorates the fines for infractions of the law regarding tampering with milk are comparatively small. The magistrates place the fines at only $5 or $8. This is too small for certain offenders, and these magistrates ought to be brought to task. (Applause.) The man who waters his milk does so in cold blood, so to speak. A man who will steal in a store may do so on an impulse; and, in my opinion, the man who coolly goes every morning and put water in his milk is by far the worse man—the meaner thief. I hope that the other inspectors will do what they can to bring the magistrates up to a higher sense of their duty. The inspectors should meet together and agree upon a concerted plan.

Mr. Whitton: I think that Mr. Publow has taken the right way of getting at the facts of the case. The inspectors are badly handicapped by a great many of our salesmen. Some of these salesmen are afraid of having certain individuals prosecuted, and bring all possible influence to bear to quiet the matter. Some presidents and salesmen are

fearful of losing their positions, and they have not got enough backbone to support our inspectors. There is a cheese factory on these four corners, we will say, and another on the next four corners, and the fellows who are on the line between the two factories are generally the chaps who are doing this tricky work. If one of these border fellows does anything wrong, the salesman will say to the inspector, " Do not do anything to that man, or we will lose his patronage." The makers should and decide that they will not take any milk from any man whose milk has been rejected by another factory.

Mr. A. F. Wood : I have had men come to me as a magistrate—men of character and standing—and say that they had been threatened by the inspector and told that their milk was wrong, and that they were to pay a fine of $10. I have known men in this vicinity who have been thus threatened, and I have told them not to pay it. One man thus advised by me refused to pay the $10, and he was not fined, because the president of the factory testified that he did not think that he had tampered with the milk. The Babcock test may sometimes be in the hands of men who have not been properly educated in the use of that instrument.

The President : Our instructors are all trained men. If these men bring an offender up before a magistrate that functionary should strengthen their hands as much as possible.

Mr. Payne : I took a course in the Wisconsin Dairy School, and had a high percentage of marks in the examination ; and I have found in making the Babcock test that with the same class of milk that there will be variation in the record from time to time, and from day to day—sometimes nearly one point in the difference. Mistakes have been made sometimes, and people have been suspected and accused who have really been above reproach.

The President : There are six milk cans on stands along the road, and the waggon comes along and picks them up. Five of these cans have milk averaging 4.5 per cent. of butter fat, and one can has milk that will test only 2 per cent. Does that mean that there has been a steal ?

Mr. Gallagher : Are these offenders accused oftenest of skimming or watering ?

The President : Of watering ; because the pump is the handier way.

FINANCIAL STATEMENT.

Receipts and Expenditures of Cheese and Butter Association, Eastern Ontario, for 1899.

Receipts.		Expenditure.	
To Cash on hand from 1898	$ 57 95	By expense Convention at Kingston	$ 580 03
" Membership fees	106 00	" Reporter	100 00
" Legislative grant	3,250 00	" Printing	125 65
" Advertisements	109 00	" Advisory Board Meeting	114 75
" Refund for Secretary	25 00	" Interest and Discount	16 16
" Prosecutions	2,067 34	" Directors' Meeting, Toronto	221 00
" Factory fees from Inspectors	2,909 50	" Grants to Industrial and Fat Stock Shows	100 00
		" Officers Salaries	186 00
		" Acid for Instructors	48 25
		" J. A. Kerr, bal. salary, 1898	25 00
		" M. Sprague, salary and expenses	400 00
		" A. P. Purvis, "	1,092 00
		" L. A. Zufelt, "	930 00
		" G. G. Publow, "	1,014 00
		" Hugh Howey, "	780 00
		" G. H. Bensley, "	735 00
		" J. B. Lowery, "	810 00
		" R. W. Ward, "	850 00
		" Balance on hand "	396 95
	$8,524 79		$8,524 79

We the undersigned hereby certify that we have examined the accounts and vouchers of P. R. Daly, Esq., Treasurer, Cheese and Butter Association of Eastern Ontario, and find them correct in accordance with above statement.

Morden Bird,
F. W. Brenton, } Auditors.

ELECTION OF OFFICERS.

The election of officers passed off unanimously, and resulting as follows :

President		D. Derbyshire	Brockville.
1st Vice-President		John McTavish	Vancamp.
2nd Vice-President		L. L. Gallagher	Wilton.
Secretary		R. G. Murphy	Elgin.
Treasurer		P. R. Daly	Foxboro.'
Directors: Division No.	1	Edward Kidd	North Gower.
"	2	Wm. Eager	Morrisburg.
"	3	J. R. Dargavel	Elgin.
"	4	James Whitton	Wellman's Corners.
"	5	T. B. Carlaw	Warkworth.
"	6	Henry Wade	Toronto.
Auditors		Morden Bird	Stirling.
		F. W. Brenton	Belleville.

Instructors :

A. P. Purvis	Maxville.	G H. Bensley	Warkworth.
L. A. Zufelt	Chesterville.	J. B. Lowery	Frankford.
G. G. Publow	Perth.	R. W. Ward	Peterborough.
Hugh Howey	Newburgh.		

Mr. Derbyshire thanked the Association for again electing him to the presidency, and praised the officers who had given him such excellent help during the years he had occupied the chair.

POINTERS ON CHEESE-MAKING.

By Prof. H. H. Dean, Ontario Agricultural College, Guelph.

As this is the last session of the Convention it may be in order for me to review some of the main points in connection with cheese and cheese-making. I understand that in a long discussion yesterday you went into the details of making, so I will content myself now with emphasizing some of the leading things in connection with the business, as they present themselves to us to-day. At the beginning let me utter a word of caution to both cheese and butter makers. When you have reached a high point there is a tendency to become satisfied, and serious effort for further improvement is not likely to be made. Although we have done well in the past, it would be a great mistake for us now to rest satisfied with what we have accomplished. The world to day is asking for and expecting progress along every line of human endeavor, and if I read history aright the main point in the struggle in South Africa is to get the people there to make progress. And so we must not be satisfied with what we have done in the past, but must advance still further or we will be left behind. I am afraid that our success in the past season may make our cheese-makers and factory owners careless in the coming year. The history of the cheese trade has shown that when there has been a good season with everything working well the following season has usually been the very reverse.

One of the things referred to by some of your inspectors is the fact that a number of factories are sending out improperly cured cheese. I know that when there is a strong demand for cheese, as in the past season, the tendency is to rush the cheese out of the factory as soon as possible. No cheese is fit to leave a factory until it is at least two weeks old. Cheese which have been shipped two or three days from the hoops are not fit to eat. I hope you will read all the dairy literature possible, and get up to the times. Our salesmen should study the markets more closely than they have done. After all, the success of the cheese or butter business depends largely upon the hearty support of the patrons, and that support is not likely to be given in its greatest measure unless we can

make the business profitable for them. No man wishes to enter or remain in a business that does not pay. We naturally look for some reward for our labor. If there is no reward, or only a slight reward, the people are likely to grow careless. Cheese and butter makers should take more interest in the patrons, and go out and visit them as often as is possible. I know that the instructors are busy men, and cannot get out as often as they wish among patrons, but makers should do more visiting. We are apt as instructors and makers to lay all the blame on the patrons if any fault is found with the quality of the cheese. But the patron has also many difficulties to contend with. Some of the difficulties they have to face arise from various causes. I know that at the College we have taken the milk from our own cows, and have kept everything as carefully and as clean as possible, yet I am satisfied that at certain times of the year, owing to atmospheric conditions there will be bad flavors, and gas will be in the curd, no matter how the milk may have been treated to avoid that very trouble. Now take that flavor, sometimes called "goose" flavor, that has given so much trouble in the western part of the Province, and which you have perhaps had trouble with here in the east. This flavor develops in the curd and not in the milk. I have met with but one man who says that he has detected it in the milk. The patrons are almost powerless to get at some of these flavors in order to get rid of them. I believe that the cheese or butter maker who will get out among his patrons from time to time, and give them some needed advice in a right and kind sort of a way will be able to accomplish more than any other man can— even more than the inspector could. Now, I admit that the average maker is over-worked, yet I think they could do something in the way of visiting patrons with mutual advantage.

There are three things that give the cheese-maker a good deal of trouble: 1st, bad flavor; 2nd, gas; 3rd, over ripe milk. We have been making some tests to see at what temperature it was best to keep the milk over night. Some say that it is not necessary to cool milk for cheese making, and I used to say so, too; but I have come to the conclusion that it is necessary to cool milk to 60 degrees at night, in hot weather, or the milk will be over-ripe in the morning. There are times when it may be necessary to cool to 55 or even 50 degrees on Saturday night in order to have the milk ready for cheese-making on Monday morning. In fact it can be laid down as a general rule that if the Saturday night's milk is to be fit for working into cheese on Monday morning dur-hot weather it must be kept below 60 degrees if at all possible. And even at a temperature of 60 degrees, milk will sour in hot weather. When milk is over-ripe or is working fast, you cannot make such good cheese as in the case of milk in normal condition, nor can you get as much cheese from a hundred pounds of such milk. That means a less return of cheese product from a given quantity of milk for both patrons and manufacturer.

We have made about forty experiments in the past season to find out the exact facts in regard to the aeration of milk. Our cheese-makers recommend aeration, but only a few experiments have been made. But at the College we took the milk of our own cows, and aerated one-half of it, but did not do so with the other half. We found that the aerated milk was sweeter in the morning, for the aeration had cooled it, but we found that there was not so much difference in the general result as we were led to expect. If the cows have clean and wholesome food, and are in clean surroundings aeration may not be of so much importance as we have been led to believe. But if there is bad food, or food that has a bad flavor, then aerating the milk in a pure atmosphere will do good. But aerating milk in a barnyard where the dust is blowing into the aerator is worse than useless. One night last summer it was very windy and dusty, and some dust got into the milk, and it was the gassiest lot we ever had. We have tried another test. We have taken the first few streams from the cows and rejected the same, but even then we found gas in the curd, although some have said that in this way we should not be likely to have trouble with gas. However, I am not prepared to say that will always be the case. We shall need a number of years of experiments before coming to correct conclusions regarding this point. Some experiments have also been made by milking the cows out in the pasture field, away from buildings, in order to see what benefit would be to the milk. Our pasture field is about half a mile from the buildings. Now, we milked in the pasture field, and also aerated the milk there, and as far as we could see there was no improvement in the matter of gas in our cheese. Therefore, I say, do

not be too hard on the patron. I make no excuse for dirty patrons, or men who permit bad conditions to exist, but makers should assist patrons in every possible way.

We need a marked improvement in the condition of many of our factories, and in their equipment. In a number of our factories at one time it was necessary to roll up your pants and have thick-soled boots if you wished to keep clean, and if you leaned up against the vat or the curd sink there would be a stain across your clothes. If we do not do anything else at the dairy school we keep harping on this point of cleanliness in the factory, cleanliness in the surroundings, and cleanliness of person on the part of the maker. I cannot understand how good cheese or butter can be made in factories where the floors are dirty or slimy. I find, too, that very many floors are leaking, and that is a menace to the flavor of cheese. I will tell you how we put down a floor in our dairy building last season. We got the best Georgia pine we could get, costing $30 per thousand feet, an inch and a half thick, and put the joints together with white lead. Then we put on a coat of linseed oil, turpentine and drier. We soaked it twice with that to fill up all the cracks and pores in the floor. If the floor is treated twice a year with that it will improve it and add to the cleanliness and safety of the factory.

The drainage about the cheese factory or creamery should also receive careful attention. For a gutter I prefer a block of pine 6 x 6. I do not believe in galvanized iron, which soon wears out. I would connect such a gutter to the sewer tile. See that all the drainage is taken away as far as possible from the factory ; but do not run it into the pasture field of a patron. That sewage should be treated in some way to prevent bad flavors from getting into the air and water to injure the milk of cows. Where you have sufficient fall you could with advantage build a filtering bed, which could be done at a comparatively small cost. If a very small factory I would recommend a bed about 10 x 12 feet, made as follows : excavate about two feet deep and put in a row of six inch drain tile. Then fill three to four feet of coarse sand or gravel on top of the tile. Run all sewage on the filter bed. The impurities are taken out by the sand, and the water which runs away from the tile below will be harmless. The sewage water filtered through such a bed is said to be purer than the water from many of the wells from which drinking water is taken.

After the milk comes into the factory it should be handled carefully. We made experiments this last season with two sets of 600 pounds of milk, each taken from the same vat. As the result of several experiments, we found that where the curd was handled roughly there was a loss of about one pound of cheese from the 600 pounds of milk. That would mean a loss of $1 on each large vat of milk. We tried the experiment mainly to see if there was any difference in the texture of the cheese made by rough handling, and to our surprise we found there was little or no difference in the texture, but there was a difference in the amount of cheese made, to the credit of the carefully handled milk.

Where cement floors have been used in the factories of the west they are well spoken of, although some of the makers complained of them being a little cold.

Prof. Dean then referred to the experiments made at the college in reference to curing cheese at different temperatures. He found that the results of 1899 agreed with those of 1898 in the main, but there was not the same marked difference in quality as was found last year, although the cheese cured at 60° were finer in flavor and texture than those cured at about 70°. There was also less loss in shrinkage by curing at the lower temperature.

Experiments were made by placing cheese in a warm room for about a week and then removing them to a cool room to finish the ripening process. The experiments indicated that there was little or no advantage in doing this as compared with curing the cheese at a uniform temperature of 60° to 65°.

He concluded by urging makers to give more attention to the curing of their cheese. The curing-rooms should be properly insulated, and some means adopted whereby th temperature could be controlled in extreme weather. The maker who will do this, wil find that his cheese are more uniform in quality, and they will lose less in weight during the curing process.

PIGS FOR HOME AND FOREIGN MARKETS.

BY F. W. HODSON, LIVE STOCK COMMISSIONER, OTTAWA.

For more than a decade the production of the right sort of pig has received a good deal of attention in Ontario, and in the east and west he is also being considered. The export bacon trade and the home consumption has steadily increased, until now the curing of prime bacon has become one of our great national enterprises.

The business man who has an article to sell, or who expects in the future to have, will, if he is wise, carefully consult the consumer's requirements. For our pork products we have—

1. The home market for fresh pork.
2. The home market for hams and bacon.
3. The lumber woods and mines.
4. The export trade.

For the first the demand is very insignificant; the spare-rib, sausage and tenderloin, all known as offal, find a fair market from Sarnia eastward. The demand for what little fresh pork is used is for light, lean meat, in the shape of chops and loins; if heavier pork is used for this purpose much of the fat is pared off. It is to a great extent the fresh pork trade in Chicago, Detroit, Cincinnatti, Louisville, Buffalo, New York, and other cities that maintains the price for hogs on the American side. We have not the population in Canada, therefore our packers ship considerable quantities of offal to the United States, and, after paying two cents per lb. duty and express charges, they still realize a higher price than can be obtained in Canada.

In Canada the consumption of bacon and hams is rapidly increasing, but the demand is for lean, nicely marbled flesh, just the goods required by the best English trade.

The lumber and mining camps will buy and use fatter meat than any of our other markets, but even here there is a growing demand for lighter and leaner goods—both as long clears and barrelled pork.

The Canadian export trade is almost entirely in lean, mild-cured sides, known as "Wiltshires." To produce this brand the packers require a long, deep, smooth pig, possessing a light head and shoulder, an even back, not too broad, but well covered with flesh, not fat; at the same time he must not be a razor-back. The sides, from ham to back of shoulder, must be long and deep; the underline straight and free from flabbiness; the ham smooth and tapering, with the greatest amount of flesh on the outside. The pig must stand on strong (not coarse) well-set legs and feet, and he must be healthy, vigorous and a good feeder. We find this is the style of pig required by both our home and foreign markets.

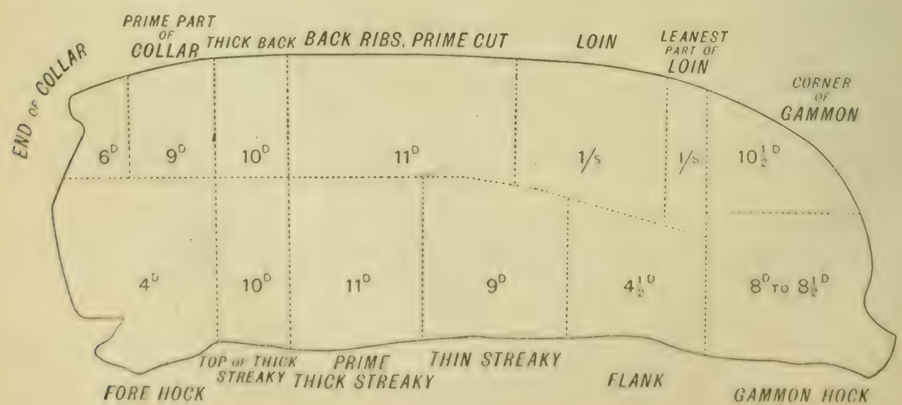
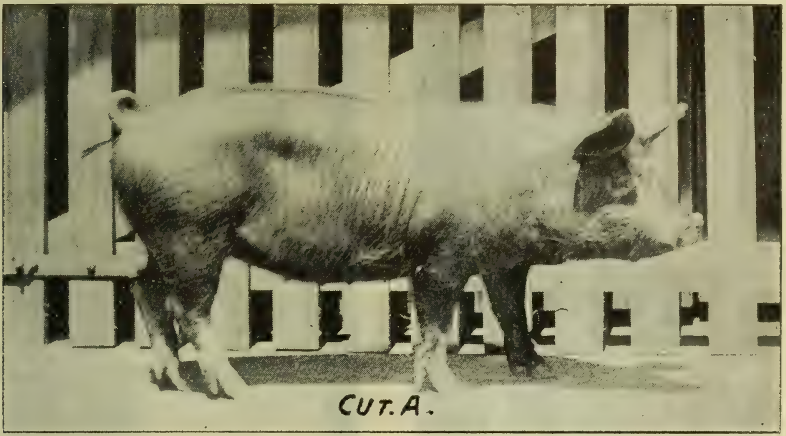


FIG. 1.—Diagram showing various cuts of a side of bacon, and the average prices realized for each during 1897. (Copied from R. A. S. Report for 1898).

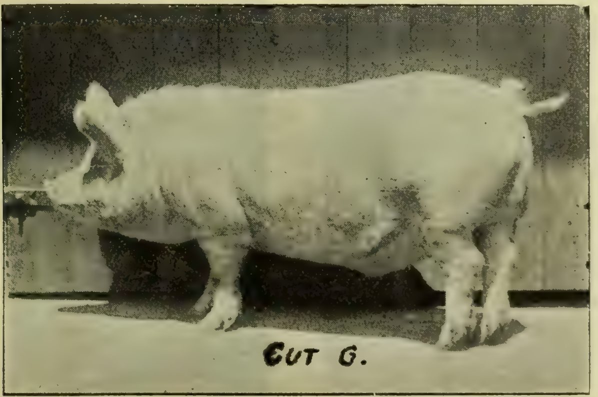
Though the greatest care may be taken by both our feeders and breeders to produce just what the markets require, there will always be enough of the heavy fat type to more than fill all demands. The aged sows and stags must be disposed of. To do this to the best advantage they should be made as fat as possible, their chief value is for lard, and unless they are made very fat they are of little use to the packers.

That we may understand the value of the various cuts, and realize the necessity of producing pigs of the proper type, I direct attention to diagram No. 1.

A careful study of this chart will well repay any interested person. The most valuable meat is found between the shoulder and the ham.



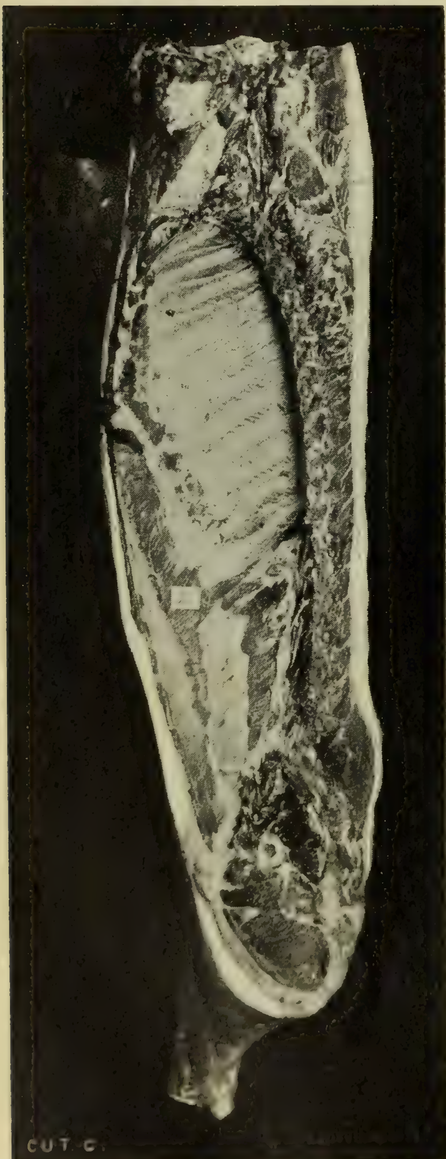
CUT A.—Too thin. A sample of thousands of unfattened hogs sold by the farmer at a loss to himself and with no satisfaction to the packers.



CUT G.—A pig forced from birth.

I will now direct your attention to cuts A and C, which represent an unfinished pig. Hundreds of such are annually received by the eastern packing houses. They are too light and too thin, and should have been fed from thirty to sixty days longer. Packers do not want this sort ; they prove a loss to the trade and to the feeder, as well as to the country at large. As for No. A, nobody wants it. Still it has to go into consumption somewhere, to the injury of the Canadian market at home and abroad. In the English market it is known as "skin and misery."

Another very objectionable type is represented by cuts G and I. These represent a forced pig, before and after curing. The sides are too short, the shoulders too heavy, he is pot-bellied ; all such dress out a large percentage of offal. His underline is very



CUT C.—Too thin. Side cured ready for shipment. Side of pig shown in cut A.—Note the slight thickness of fat on the back, considerably lower than the standard.

CUT I.—Side of forced pig, cured. Too thick and fat.

defective, indicating a poor class of meat where good cuts should be found. Cut I is the cured side of this pig, and is unsaleable except at a very low price, whether in Europe or Canada.

D1 was a famous prize-winner at Toronto exhibition, said to be one of the best pigs ever shown at Toronto. This is in the condition old sows and stags ought to be when sold to the drover. Her shoulder and jowl is too heavy ; the head is worth only one to

one and a-half cents per lb., while the shoulder, as we have seen, makes cheap meat. Her underline is very good, but the back is a little slack; the neck too heavy and the

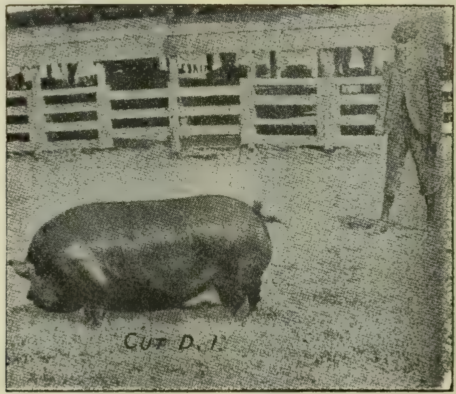
Cut F.—Too fat. Cured. Side view of part of carcass shown in cut E.

Cut M.—Cured side. What is required for British market. Side of bacon, first-class quality. Note the even disribution of lean.

back too broad. Cut F shows a cured side such as made from this sow. There is altogether too much fat in proportion to the lean to be saleable, except as lard, and to a limited extent to the mines or shanties—markets which should be supplied by our culls.

D2 is a type of pig the most careful and experienced breeders will sometimes get. He is too heavy in shoulder and jowl, short in the side, flabby in the rear flank, light in the ham and heavy in the back. Yet he is a more saleable pig than any of the before mentioned. As well as being off type, he is too fat; he belongs to a type that makes fat nstead of flesh, and is now over-fat. It would have been more profitable to have sold

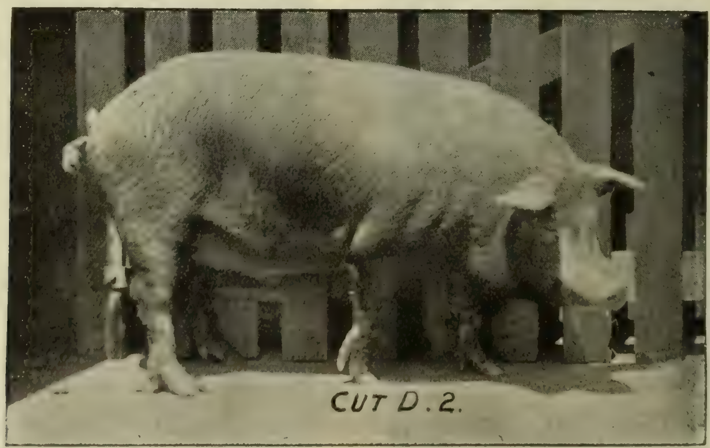
him a month earlier. As he was photographed he weighed 200 pounds. If a farmer has a pig of this type, it will pay him better to kill him when quite small and use him as fresh pork or sell him to a local butcher. He never should be made into export bacon. If not killed young, such pigs should be made into long clears or barrel pork. Cut E



CUT D1—Too fat. Taken at the Toronto Exhibition.

shows the pig dressed. As well as being too fat he has a very bad crown, a defect which always classes bacon as No. 2 or 3.

All the animals heretofore illustrated by cuts A. C. G. I. D1. D2. F. and E. grade



CUT D2.—Too fat Mark the heavy shoulder.

in the Canadian and English markets from No. 2 to rejected, and sell in Canada, live weight, for one-half to one cent per lb., less than prime No. 1.

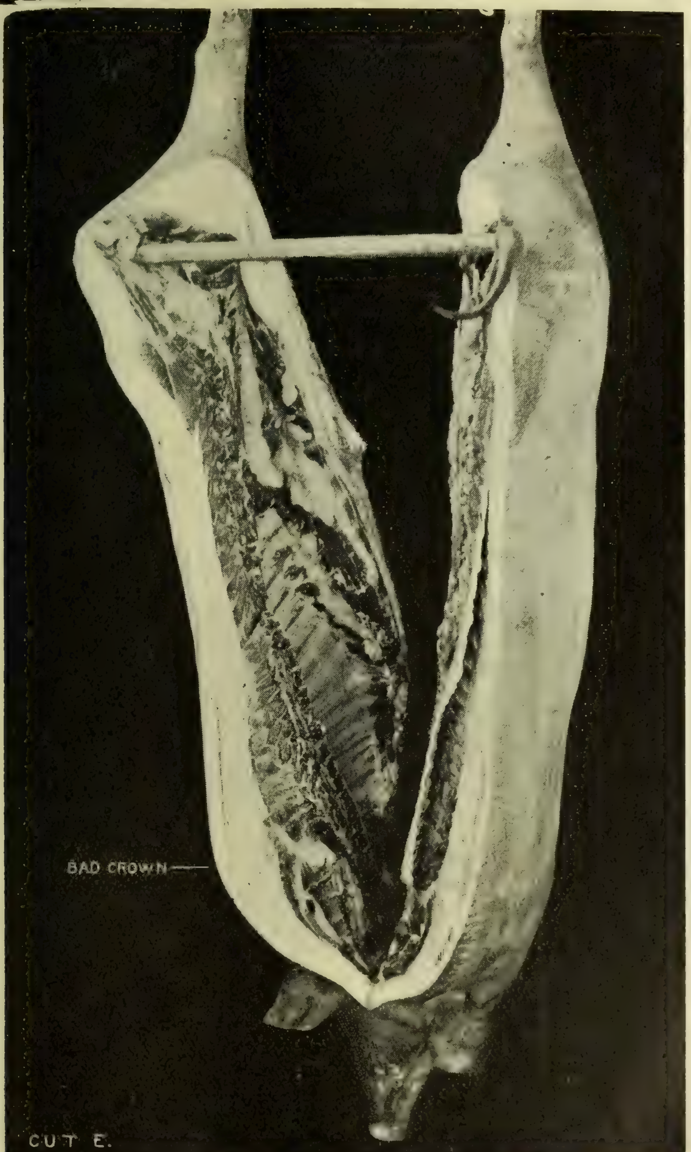
I before described a packer's model. No. K. fills the bill. He is strong, vigorous, a good feeder, has a fairly light head, a long side and a good ham.

No. 12 is also a good pig, but is heavier in the jowl and coarser than No. K. He is not so well bred and shows it.

Cut M. represents the cured side of K, and is first class in every particular. Note the lightness of shoulder, length of side, and even distribution of fat down the back.

Nos. 13 and 14 represent two model bacon hogs. No. 13 is better in head, jowl and length of side, but not as good as No. 14 in back or rear flank.

It has been proved by carefully conducted experiments that it costs no more to produce pigs of the right than of the wrong type. In fact pigs such as are shown by cuts K, 12, 13 and 14 are more economically produced than the thick fats. Being full of lean meat, they weigh better for their appearance than do the others. They are active and robust, and will consume and turn to good account coarse foods not acceptable to the others.

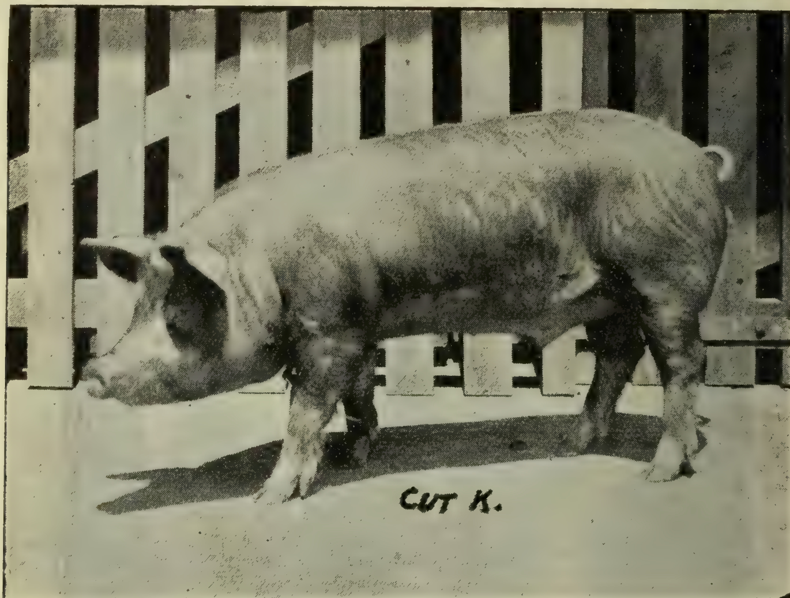


CUT E.—Too fat—dressed. The thickness of fat on back, especially on the top of the shoulder, causes this carcass to be discounted against as much as 1c. per lb.

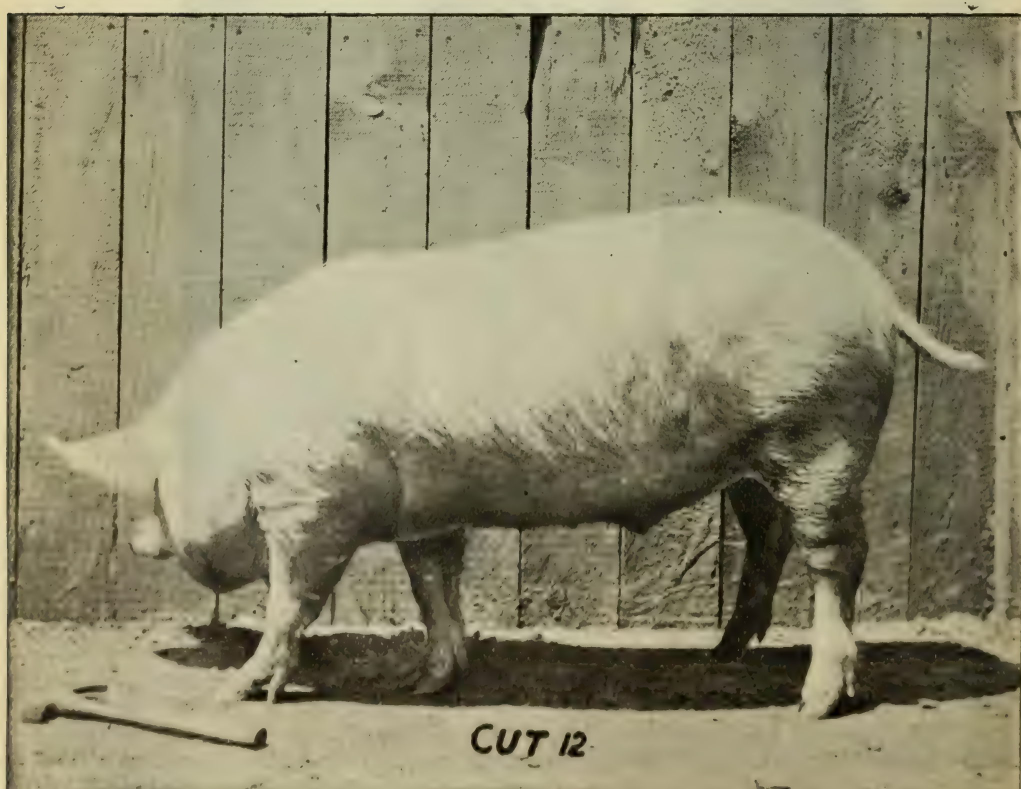
The Canadian market demands a long, lean singer, therefore it is in the interest of Canadian farmers to supply the best pigs for that purpose. First class goods means a growing market at home and abroad anything else means a stationary or receding market.

At the present time 25 per cent. of the pigs marketed in Canada are what is known

as "softs," 25 per cent. are fats, and at least 10 per cent. unsizables. Or in other words 60 per cent of Canadian pigs grade as No. 2, or lower, which is 40 per cent. more than might be expected, if breeding and feeding were carefully done. Canadian farmers lose



Cut K.—The Packer's Model.



Cut 12.—Lean Singer.

at least 20 cents per hundred on all pigs sold, because of this condition; packers fixing their buying price according to their average receipts from sales. The man who insists on breeding the wrong type not only loses 20 cents per hundred, but he causes his neighbor to do so as well; not only this but he injures the home and foreign trade. Therefore it is to the interest of every citizen that the right sort of pigs be bred on every Canadian farm, and that they be properly fed.

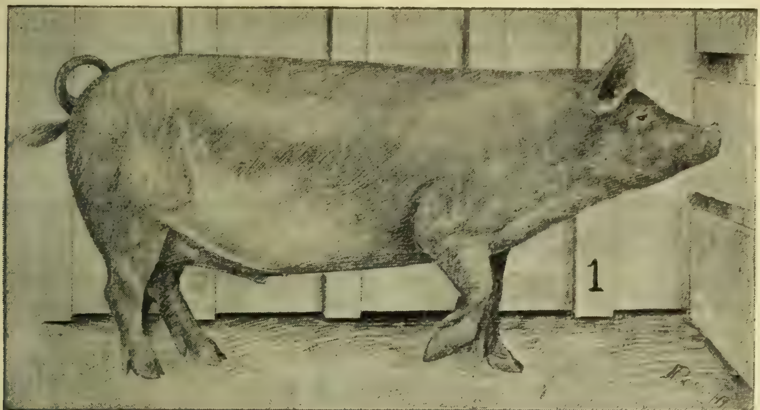


FIG. 13.—Light jowl and good neck; shoulders well proportioned; belly sags a little towards the rear; a good length of side.

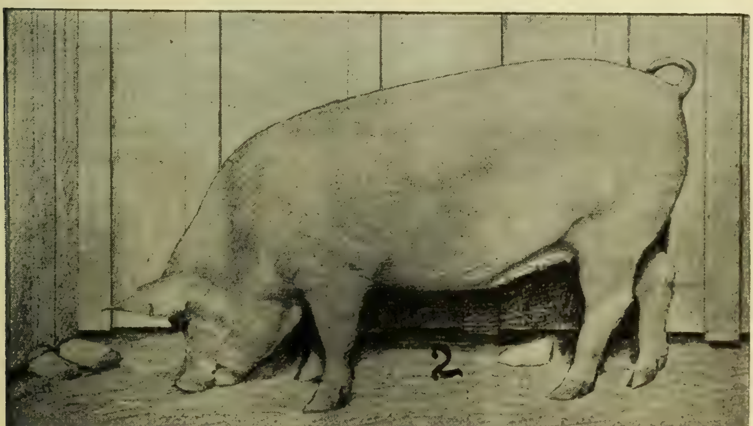


FIG. 14.—Well proportioned shoulder, good top line and good trim belly, but lacks length.

Pigs of the wrong type cannot be made good by any kind of feeding—yet bad feeding will spoil a good pig.

A NEW DAIRY BUILDING PROPOSED.

Moved by Mr. KIDD, seconded by Mr. CARLAW, and resolved:

"That the Cheese and Butter Association of Eastern Ontario, now in Convention assembled, requests the Ontario Government to place a sufficient sum of money in the estimates for the Session of 1900 to assist the Industrial Exhibition Association of Toronto, to erect a suitable building in which to hold the annual show of dairy products, as it is well known that the present building used by them is totally inadequate

for such an exhibition; and that a copy of this resolution be sent to the Hon. John Dryden, Minister of Agriculture."

VOTES OF THANKS.

The following motion, moved by Mr. Murphy and seconded by Mr. Zufelt, was heartily adopted: "That the thanks of this Convention be given to the citizen of Madoc for their splendid reception to the Association, to the speakers and orchestra for their valuable help, to the press for its sympathetic reports, and to the railways for reduced fares."

In putting the motion the President endorsed the sentiments expressed therein, and closed by exhorting the dairymen present to return to their homes determined that 1900 would be the year most deserving of success. If the valuable suggestions given in the addresses and discussions were only acted upon the Convention would be a mighty power in bettering the great dairy industry.

He then declared the Convention adjourned.

CHEESE AND BUTTER ASSOCIATION OF WESTERN ONTARIO.

ANNUAL MEETING.

The Thirty-third Annual Convention of the Cheese and Butter Association of Western Ontario was held at the new City Hall, Stratford, on the 16th, 17th and 18th of January, 1900. The first meeting was opened by the President, Mr. Harold Eagle, after which Mayor Hodd, of Stratford, extended to the Convention the freedom of the city of Stratford.

PRESIDENT'S ADDRESS.

By Harold Eagle, Attercliffe

I may say I always have a little difficulty to know whether to address you as the "Cheese and Butter Association," or "The Butter and Cheese Association." I want to congratulate you on the good attendance we have this morning, and I also want to congratulate the men in the southern counties, and also those in the eastern district, for the very successful year they have had, especially on account of the increased price both for butter and cheese; but, as to my fellow manufacturers in the southern counties, I cannot congratulate them, for this reason: We had in the southern counties the worst drouth in the last summer we have ever experienced, and making cheese on a commission was not very satisfactory. The increased price made it profitable for the farmer towards the latter end of the season, but for cheese manufacturer it did not have that effect, and I think the cheese manufacturers in the southern counties have really had an exceptionally bad year; but of course the increased price, owing to the drouth in England, has made the outlook for next year far better than it has been for a good many years. During the last two or three years a good many of the patrons of cheese and butter factories were discouraged at the low price, and some of them were becoming disheartened, but the good prices we have received during the last year will have a most encouraging effect.

I understand from the reports that the exported cheese for last year, 1899, reached the sum of eighteen million dollars, and if my information is correct the output of butter realized almost six million dollars. We are safe to estimate it at five million dollars.* Now, gentlemen, the butter industry most certainly is coming to the front. Years ago we used to try to boom cheese for all it was worth. Taking the position that possibly there might be a danger of over-doing cheese production, (I never saw the danger myself, but other men did) the efforts of this Association and others interested in the dairy industry, have lately been chiefly directed to boom the butter industry, and whatever has been tried, certainly the results have been very encouraging when we consider that three years ago the export was not two million, and this year it is almost six, gaining one hundred per cent. every year, or three hundred per cent. in three years. I am sure the dairymen of this country must feel that it is a highly gratifying result. It should encourage them to keep on pushing the business, so that in the future the industry will advance and prosper as it has done during the past three years; and I have not the slightest doubt that if every maker, every patron, and every man connected with the business, will put all the energy and vigor that is the inheritance of Canadian manhood and womanhood into the business, they will make the butter industry of Canada the largest and most prosperous in the world.

Gentlemen of the Cheese and Butter Association, there are one or two other things I want to mention. You understand the difficulty I have had in addressing you ever since the name of this association has been changed. I had to turn to the programme to see whether to address you as "Cheese and Butter Association," or the "Butter and Cheese Association." For some ten or twelve years this association was conducted under the name of "The Western Ontario Dairymen's Association," and I do not think they will ever get a name that will suit as well, and I think that if the powers that be would allow the name to be changed back to the "Western Dairymen's Association," it would be a good thing for the Association. Of course the secretary receives most of the corre-

* Since ascertained to be: Cheese, 188,327,402 lbs., valued at $19,328,918. Butter, 26,784,429 lbs., valued at $5,377,827.

spondence, but a good deal of it comes to the president, and, as president of this Association, I have to say that one-half of this correspondence comes addressed to me as President of the Western Dairymen's Association, and the Woodstock *Sentinel Review*, which is noted in Western Ontario as a particularly dairy paper, edited by an ex-president of this Association, in the report of the Cheese and Butter Makers Association meeting at Listowel, stated that that Association had appointed the instructors that this Association appointed. There are two associations, "The Butter and Cheese Makers' Association," and ours, "The Cheese and Butter Association," and there are a great many people who do not know the difference between the two associations, and I therefore think it would be much better to go back to the old name of the Western Dairymen's Association. They say "a rose under another name might smell just as sweet," and that may be correct, but I contend that we are known as the Western Dairymen's Association, and it would be better to get back to that name.

Another matter that I desire to call your attention is the very late date at which we got the reports of the last convention. We were looking from day to day, and from week to week for the reports of the convention. If I remember correctly, it was the second week in August before we got the report of the last convention, so I want to say this much to the new Board of Directors, that I think it is advisable for this Association, if the Department of Agriculture cannot get out the report of this convention before the cheese makers start business, this Association should do it themselves. When the report of the convention comes out the last of August or the first of September, it is of no more use than a last year's bird's nest. (Applause.) I meet different men who say, "What good does the Association do? It is not only the farmers who are supplying the milk do not get it, but there are some men who are making the most money out of cheese and butter, that you never see at the convention;" and my reply is, to the farmer who is making nothing out of it, and also to the man who is making money out of it and who never comes here, that, supposing there had never been an Association, and everybody connected with the industry were going right along from year to year, the export of cheese and butter would never at this time have amounted to what it does, twenty-three million dollars. And these very men who say they get no benefit from the Association are reaping a very large and substantial benefit from the efforts of this Association, and if our work was abandoned to-day these same men would soon find out that the Association had been a great benefit to them, and they would be the very first to ask to have it reorganized and put into active operation.

Now, I am glad to see so many of you here at this our opening meeting. The few remarks I have made, as to the name of the Association, and the very late time at which the report is issued, I have said because I thought it was my duty to call your attention to these matters. If the Department cannot get out their report before August the Association should do it themselves. Whatever new ideas we have had come from the bulletins and from the platforms of similar meetings to this of the different associations, so the reports of these meetings should be in the hands of the maker before he starts his business. Thanking you for your patient hearing, I will proceed with the next item on the programme.

REPORT OF DIRECTORS.

The directors of your Association for the year 1899 submit the following report:

The past season has not been a profitable one to cheese and butter manufacturers whose income is derived from commissions on quantity instead of on value produced. Owing to the long drouth the production was very small. On the other hand, the very high prices obtained, have, in the case of patrons, offset the loss from small production. The high price ruling in the fall will have a tendency to encourage farmers to increase the production. If so, the maker may, with average weather, look forward to a more profitable season in 1900.

The Directors have continued the work of this Association on the lines followed during the two previous years as defined in the Report of the Directors a year ago.

INSTRUCTORS.—In response to the remarks of the President at the convention last year, regarding instructors, a considerable number of first-class men offered their services to the Board. The following were selected and were duly appointed: James Morrison

(third year); C. O. Luton, Geo. McDonald, and Arch. Smith as Instructors and Inspectors at Cheese Factories. Arch Smith was also appointed to the same position as regarding creameries. They will each lay before you a report of their work.

Grants to Exhibitions.—The finances of the Association being again in a sound position, your Board was enabled to again make grants to the Industrial and Western Fairs for their Dairy Department. An increased grant was made to the Industrial Exhibition on condition that improved accomodation, satisfactory to your representatives was provided, such as suggested by the President of the Fair to your Board, at their meeting in 1898. Although the condition was not carried out in full, you representatives felt justified in authorizing the payment of the grant. A deputation, of which your representatives were members, waited upon the Provincial Government to urge them to erect a building suitable for the Dairy Exhibit. Your attention will be called to this subject later, when you will be asked to consider the adoption of a resolution on this subject, both with reference to the erection of a suitable building, and also with reference to the management of the Dairy Department of the Industrial, which is far from what it should be. Here your Board desires to express to the Windsor Salt Company its appreciation of their contributions, through this Association, for prizes for the Dairy Department of the Industrial and Western Fairs. The subscriptions were without any conditions. The prizes are to be presented at this meeting.

Essays.—Your Directors decided to appropriate the sum of Two Hundred Dollars ($200), to be offered for essays by parties who had actually been employed in the making of butter or cheese in Western Ontario factories in 1899. They have reason to congratulate the Association on the response that has been made, no less than 67 essays having been sent in. The report of the judges will be duly made. The following are the names and addresses of those who have contributed essays :

List of Essay Writers on Cheese Making.

F. H. Brooks .... Zenda.
J. J. Fisher .... Stratford.
S. J. Roy .... Belgrave.
Colin A. Campbell .... Stratford.
Oscar Soverein .... Windham Centre
Haddon Goodhand .... Strathroy.
W. J. Clark .... Thedford.
Walter S. Downham ...... St. Thomas.
R. R. Cranston .... Lawrence.
James Burgess .... Bluevale.
Thos. E. Nimmo .... Ripley.
J. S. Clark .... Warwick.
Reuben A. Treleaven ...... Cape Rich.
Jas. L. Thomson .... Hawkesville.
Geo. Menzies .... Sheffield.
J. S. Isard .... Paisley.
Albert E. Pickard .... Glammis.
Geo. R. Mayo .... Sebringville.
Duncan M. Scott .... Tavistock.
E. B. Shields .... Brockville.
Wm. A. Bothwell .... Hickson.
D. A. Dempsey .... Stratford.
Mary Morrison .... Newry.
A. F. Clarke .... Poole.
M. Knechtel .... Dorchester.
A. W. Edwards .... Caistorville.
John F. Uren .... Snelgrove.
Ed. Andrus .... Putnam.
W. B. Thomson .... Nile.
J. B. Anderson .... O. A. C., Guelph
J. W. Copeland .... Avonbank.
M. Morrison .... Harriston.
J. B. Renny .... Burgoyne.
Wyatt Cameron .... Jarvis.
A. J. Wagg .... O. A. C., Guelph
J. F. Millar .... St. George.
Geo. Thompson .... Parkhill.
Geo. Travis .... Courtland.

List of Essay Writers on Butter Making.

Mrs. M. I. Badger .... Warkworth.
Alex. Robertson .... Ellengowan.
Mrs. W. H. Taylor .... Parkhill.
Geo. R. Mayo .... Sebringville.
D. L. McIntyre .... Crosswell, Mich.
W. F. Baskerville .... Strathroy.
A. F. Clarke .... Poole.
C. H. Thomson .... Strathroy.
T. A. Wiancko .... St. Marys.
Frank D. Booth .... Ingersoll.
S. R. Brill .... Teeswater.
Miss C. Smith .... Maple Lodge.
Miss Janet McNevan ...... Rosedale.
John C. Taylor .... Union.
E. I. Smith .... Woodstock.
J. R. A. Laing .... Avonbank.
Wm. Johnson .... Midmay.
Wm. Waddell .... Strathroy.
T. B. Marshall .... Tiverton.
John Cox .... Courtice.
J. M. Livingstone .... St. Marys.
J. F. Millar .... St. George.
M. Morrison .... Harriston.
Wm. Elliott .... Galt.
A. A. Frye .... Strathroy.
Janet Stewart .... Hampstead.
Mrs. Duncan Stewart ...... Hampstead.
Christina Stewart .... Hampstead.

FINANCIAL.—The financial position of the Association is, as will be seen from the Treasurer's report, now to be submitted, again satisfactory.

REPORTS.—The report of the proceedings of this Association, if they are to be of value, should be in the hands of the members before the new season's work at the factories commences. We recommend that the new Board take such steps that the reports will be distributed not later than April 1st.

All of which is respectfully submitted.

HAROLD EAGLE, President.

FINANCIAL STATEMENT.

The secretary-treasurer, Mr. George Hately, then read the financial statement for the year 1899, which, on motion, was received and adopted as follows :

RECEIPTS.

To cash balance from the audit of 1898	$ 595 05
Membership fees, 318 at 50 cents each	150 00
Legislative grant	3250 00
Instructors' fees	770 70
Prosecutions	155 80
Total receipts for the year 1899	$4930 55

EXPENDITURES.

Convention expenses	$ 450 69
Directors and Committee meetings	185 50
Reporting	70 00
Instructors	2566 50
Auditors	8 00
Officers' salaries	36 00
Postage, telegraph and telephone	43 16
Printing and stationery	36 50
Grants	150 00
Accounts not paid, 1898	6 00
Instructors' supplies	16 83
Total expenditure	$3893 18
Balance forward to 1900	$1037 37

REPORT OF INSTRUCTOR JAMES MORRISON.

DISTRICT. The district allotted to me was the south-eastern portion of western Ontario, comprising the counties of Oxford, Norfolk, Brant, Haldimand, Welland, Lincoln, Wentworth, Halton and Peel. In this district there are 112 cheese factories in operation. Applications were received from thirty-three of these, asking for from one to four visits each. Owing to the fact that many of the factories in the eastern part of the district were late in commencing cheese making in the spring I had very little work to do in the month of May. I commenced my work for the Association on the 9th of May, and finished on the 2nd of November.

MILK TESTING. At fourteen of the factories I visited there was no Babcock tester. This accounts for the small number of tests made for butter fat, and also accounts, to a great extent, for a large number of samples of milk that showed that the milk had been tampered with. I would urge all factory men to have a Babcock tester in their factory and to have each patron's milk tested at least once a month. When the Babcock tester is known to be regularly used at a factory, all the patrons are more likely to receive their full profits, the regular use of the Babcock having a deterring effect on the dishonest ones. I tested 5,406 samples with the Quevenne lactometer and 208 with the Babcock

tester. Of these, eight samples tested between one per cent. and two per cent. butter fat, thirty-eight between two and three per cent., 141 between three and four per cent., and twenty-one samples four per cent. and over. Only two of the factories that I visited are paying by p. c. of butter fat.

PROSECUTIONS. Information was laid against twenty-six patrons for tampering with their milk; of these twenty-two were fined by the magistrates from $5 to $10 each, with costs; nineteen for watering, two for skimming, and one for both watering and skimming. The fines amounted to $178, and costs to $77.41, a total of $255.41. Of the four other patrons against whom information was laid, two, by what I believe to be a miscarriage of justice on the part of the magistrate, were dismissed; the other two were not proceed against, they being tried on the same day and before the same magistrate as the two just mentioned.

MAKING-ROOMS. Of the making-rooms of the factories I visited this season, I would class ten as good, fourteen as fair, and nine as altogether unsuitable to make a first-class article of cheese in; bad floors, leaking roofs, and poorly sided buildings, buildings too small for number of vats, presses and other utensils; not space enough between vats to be easily kept clean; poor drainage; were the principal objections at these factories.

CURING-ROOMS. A majority of curing-rooms visited are not in the best condition to cure cheese properly. Although we have heard very little of cheese being over-heated the past season, our curing-rooms cannot claim the credit of keeping them in that condition. The cool nights of the past season, without any long periods of very warm weather have been the salvation of the cheese in a great many factories.

SUB-EARTH DUCTS. Sub-earth ducts have been added to four of the factories in my district, and have proved a great help in controlling the temperature of the curing rooms at these factories. A number of factorymen have put ice boxes into their curing rooms (made as described by Mr. A. T. Bell at last year's convention) with very good results.

WHEY. Of the factories I visited, twenty-eight returned the whey to the patrons in their milk cans, three fed the whey at the factory, or had it drawn away, the other two fed part of it at the factory and the balance was returned to the patrons in the milk cans.

WHEY TANKS. The makers at a majority of the factories are becoming more alive to the necessity of keeping their whey tanks clean, but I regret to report that at some factories the whey tanks are positively dirty, not being cleaned out during the whole season. In talking with one patron of a cheese factory about dirty whey tanks, he said their cheese-maker last year had the whey tanks washed and scalded out every week or every second week, all the season, and was continually finding fault with the milk for bad flavor, and sending home milk almost every day, but during the past season the tanks have not been cleaned out since spring, and the maker has found fault with scarcely any milk all the season. I assured the patron that a clean whey tank was not the cause of bad flavors in the milk, and I urge all factory men who have not elevated tanks, to raise them up before starting the factory next season, and all makers where the whey is returned to the patrons, to see that their tanks are kept clean. They will thus remove one of the greatest causes of bad flavors in milk.

CLEANLINESS. Our cheese-makers as a rule are improving in regard to keeping their factories and utensils clean, but there are some yet who seem to think if they get their cheese away from the factory without any loss to anyone, they are doing all right. To the makers I would say: "Get away from your factories for a few days, visit some of the best factories in the neighborhood, and be sure to invite the makers of these factories to come and spend a day with you. I am sure you will want to give your factory a thorough cleaning up before they come, and after you once have it nice and clean you will take more interest in keeping it clean.

QUALITY. The quality of the cheese this season has been much better than last year. The milk arrived at the factory in much better condition on account of the cool nights. The makers paid more attention to the even size and finish of the cheese. There was very little mould on the cheese, and owing to their never becoming over-heated; this made them look altogether more attractive to the buyers, which, together with the good prices realized, made the past season satisfactory to makers and patrons both.

RECOMMENDATIONS. Before concluding my report, I would ask our cheese-makers not to be satisfied with getting along well during the past season. The coming year may

not be so favorable for making fine cheese. By starting out next spring with keeping everything in and around the factory clean and tidy, and practising the same all the season, it will help to overcome a great many of the difficulties a cheese-maker has to contend with.

After Mr. Morrison's report was read, the chairman stated to the audience that it was open to criticism. No person having criticised the report, he said he took it as a credit to the instructor that the report was not criticised, and he presumed that the report was therefore above criticism.

REPORT OF INSTRUCTOR C. O. LUTON.

DISTRICT. The district assigned to me comprised the counties of Essex, Kent, Lambton, Middlesex and Elgin.

INSTRUCTION AT FACTORIES. In this district there are 100 cheese factories in operation, but, owing to the very dry weather, especially in the western part of the district, some of the small factories were compelled to close down after running a very short time. The dry weather also had a very bad effect on my work, as the makers did not feel like paying for the services of an instructor when they had so little to do. I visited seventeen of the factories, giving from one to four visits each. I spent forty-two days in factories with makers, and four days were cancelled owing to the factories closing down.

MILK TESTS. I tested 2,677 samples of milk with the Lactometer and 205 samples with the Babcock Milk Tester. The samples tested all the way from 2.6 per cent to 4.00 per cent of butter fat. Samples of milk taken from the vat during the months of May, June, and July tested from 3.00 to 3.4 per cent of butter fat; and in August, September, and October, from 3.6 to 3.8 per cent. of butter fat.

PROSECUTIONS. Three patrons were fined for tampering with their milk. They were taken before a magistrate, and fines varying from $5 to $25 were imposed on them, the fines amounting in all to $40. Of these one was in Elgin and two in Middlesex. One factory I visited paid for the milk according to quality.

MAKING-ROOMS. The majority of making-rooms I visited I classed as clean, of the balance some were fairly clean, and I am sorry to say some were very dirty; but take them altogether I believe there has been a great improvement along this line. The principal fault to be found is poor floors and bad drainage, when allowing whey and wash water to leak through and remain under the factory for weeks—yes, in some cases the whole season—causing a very bad smell, especially in hot weather.

CURING-ROOMS. There has been more improvement in curing-rooms than in making-rooms. A great many have put in boxes, using ice with good results, where the ice is put in before the rooms gets too warm. It should be put in at a temperature below 65 degrees, as while the temperature can be held down, it is not so easy a matter to lower it. One of the factories I visited, put in a sub-earth duct during the past season, which gave very good satisfaction, the temperature never going above 69 degrees in the warmest weather. I have seen this same room in other seasons go as high as 82 degrees. I do not wonder at some of the makers having their cheese rejected on account of being overheated, when you see the place they have to keep them. I have seen rooms this season that were nearly as warm as the weather outside, which, together with no ventilation makes a very undesirable place to keep cheese in.

STARTERS. Some makers were using a starter prepared with Lactic Ferment with good results. A few were preparing it in a haphazard manner, and were having the usual bad results. I would advise all to prepare with lactic ferment, and be careful not to use too much.

SINKS AND SINK CLOTHS. The majority of sinks and cloths were clean and sweet, but there were a few that were far from being clean. Now, one cannot expect to have a clean flavored cheese that has been made in a dirty sink. I believe that is where a good deal of this bad flavored cheese comes from. When a maker's curd sinks are in that shape, the maker is not in a position to dictate to his patrons about keeping their cans, pails, etc., clean.

ATTENTION TO DETAILS. Before concluding my report I would urge every maker, before starting next spring, to clean up the yard of anything that might be lying around.

Pile up the wood, repair the fence, have the premises clean and tidy before starting, then keep it that way. They will be well repaid for their trouble.

PROSECUTIONS. I forgot to say in my report on prosecutions, that there were nineteen other patrons who should have been taken before a magistrate, but as the factorymen did not want to prosecute them, they were let go with a warning.

Mr. A. F. MACLAREN : I would like to ask Mr. Luton if he finds many cheeses moulding in factories where they used these sub-earth ducts.

Mr. LUTON : In the factory that I speak about, the cheese did not mould there this season any worse than any other year. It is a bad curing-room for mould in any case.

Mr. MACLAREN : Only one factory in your district used a sub-earth duct?

Mr. LUTON : That is the only one of any importance. There are other factories that I did not visit, but they were small and the drain not far under the ground. I never could get a good report from them.

Mr. MACLAREN : How many factories did you visit altogether, and how many of them did you consider had insufficient curing-rooms where the cheese was injured by over-heating?

Mr. LUTON : Probably half the factories that I visited had good curing-rooms; they used the ice boxes. There would not have been that many, unless they had used ice-boxes to keep the cheese from heating.

Mr. MACLAREN : How many did you find using ice-boxes?

Mr. LUTON : I cannot just say the number, but wherever they used them they speak well of them.

Mr. MACLAREN : I would also like to ask Mr. Morrison the same question; how many factories he visited where the cheese was injured on account of the heating, and how many he found using ice boxes?

Mr. MORRISON : There were four of the factories I visited this year put in sub-earth ducts and at any time of my visit to the factory, I never saw any mould on the cheese whatever.

Mr. BALLANTYNE : Had they any means of keeping it off?

Mr. MORRISON : No. Of course this season there was very little mould in any of the curing-rooms.

Mr. MACLAREN : The price was too high, they did not have time to mould.

Mr. MORRISON : There would be about half a dozen factories had ice-boxes out of thirty-three, and four had sub-earth ducts.

Mr. BALLANTYNE : Ten out of thirty-three were all that were provided with any means at all of controlling the temperature.

Mr. MACLAREN : You consider sub-earth ducts and ice-boxes an improvement?

Mr. MORRISON : They keep the temperature down.

A MEMBER : Can you describe these ice-boxes and sub-earth ducts?

Mr. MORRISON : The ice box is made in a square form, four scantlings are set up to form a three-foot square and these are boarded round with matched lumber, they stand on scantling on the bottom, and there is a pan at the bottom. Some have a door in the side of the ice-box and others put the ice in over the top. The more ice they have in, the more benefit they derive, the more cool air they get from the box, and the longer the ice will last. The water is carried down to the floor, and to the outside of the factory, but is not allowed to run under the factory.

A MEMBER : Which do you consider best, the ice box or the sub-earth ducts?

Mr. MORRISON : As far as I have been able to judge this year, I prefer the sub-earth ducts. The ice box is more useful to take down the temperature, but the sub-earth duct is there all the time and never allows the temperature to get up.

A MEMBER : Do they keep them open all the time?

Mr. MORRISON : Not necessarily, but most of them do. To get the best result from the sub-earth ducts, I would advise having a partition through the centre of the curing-room, and have the ducts come in directly under this partition, so that you can close it off at one part of the curing-room and have all the air going into the other part, or into both at the same time, if you wish it.

Mr. MACLAREN : Do you think the reason the cheese did not become mouldy was because it did not become heated?

Mr. MORRISON : No, it is not necessarily the case.

A MEMBER : How was the milk this season ?

Mr. MORRISON : I think the milk came in better this season, better than any other season than I have been on the road, and the cheese has been much better too.

Mr. BALLANTYNE : How do you account for the improved quality of the milk ?

Mr. MORRISON : I think the cool nights have had a great deal to do with it.

Mr. MACLAREN : Do you think there would have been any improvement if the nights had been the same as the year before ?

Mr. MORRISON : No, I do not think so.

A MEMBER : Has the average been as high as other years ?

Mr. MORRISON : I could not say, I have not compared it. I know the average has been fairly high.

Mr. BELL : What is your opinion as to the advantage of the ice-box compared with the sub-earth ducts ?

Mr. MORRISON : One reason why I prefer the sub-earth duct is that you have it all the time. As a general thing the ice-box is not used until it becomes a necessity to use it, and by that time your curing-room has become heated more than you want it, and then it is very hard to reduce the temperature unless you have, perhaps, two ice-boxes in a fair-sized curing room, but the sub-earth duct you have all the time.

Mr. BELL : If a cheese-maker has a thermometer, could not he see the thermometer going up, fill his ice box, and control the temperature ?

Mr. MORRISON : Yes, by using plenty of ice he could do so, but as a general thing it is not used until the curing-room is heated over seventy.

Mr. BELL : That's the mistake of the cheese-maker ?

Mr. MORRISON : Yes, and for that reason I prefer the sub-earth duct over the ice-box, you have it all the time.

A MEMBER : How many factories are there in the district you represent ?

Mr. MORRISON : One hundred and twelve.

A MEMBER . How many of these factories pay by the test ?

Mr. MORRISON : Only two.

A MEMBER : Don't you think they would get much better results if they all paid by the test ?

Mr. MORRISON : The quality would be better and the care of the milk, you would expect, would be better. Still I have seen as bad milk come to the factory where they were paid by the test, as where they paid the other way, but as a general thing, where they paid by the test they complained very little of the milk.

A MEMBER : Milk well taken care of will test better ?

Mr. MORRISON : Some say it will and some say not. I say, " The better care you take of the milk, the fairer test you will get."

Mr. MCFARLANE : How many weeks' cheese would you have in the curing-room at once ?

Mr. MORRISON : I would like to see the cheese go out as soon as they are cured.

Mr. MCFARLANE : Do you think the cheese that is there two weeks, or the cheese that comes in today wants the most moisture ?

Mr. MORRISON : The one that comes in to-day wants the most heat.

Mr. MCFARLANE : How would you regulate that ?

Mr. MORRISON : By getting them out sooner.

Mr. MCFARLANE : Do the old cheese or new cheese mould quicker ?

Mr. MORRISON: Old cheese will mould quicker in the average curing-room.

Mr. EDGAR : What do you think is the reason so few factories pay by butter fat test ?

Mr. MORRISON : That is a pretty hard question to answer. They usually leave it with the patrons. If the majority of the patrons wish to be paid by the test, the factory-men are usually willing to do so, and if the majority of patrons do not want the test, it is policy on the factoryman's part to please his patron.

Mr. EDGAR : Don't you think the influence of the factoryman has considerable effect with the patrons ?

Mr. MORRISON : I think he has a great deal.

THE CHAIRMAN : One gentleman asked Mr. Morrison, if, during the last year, we had not a higher average than the previous year. I believe the cheese-makers present

will bear me out in this, that the latter end of this year took a far higher average I believe the reason was on account of the extremely hot weather in November. Owing to the warm weather in November it took more milk to make a pound of cheese than it has done for a good many years. Mr. Morrison also said this last year was a good one. Somebody asked why. The answer is easy. We have had cold nights. There is no worse difficulty in making cheese than hot nights.

Professor Dean: I would like to answer Mr. McFarlane's question why old cheese moulds more than new cheese. Mould is simply a plant growing on the cheese. It takes time for the plant to grow, and Mr. McFarlane knows that if he sows wheat or oats in a field and it is a very dry time, these plants don't grow, the seed will not sprout till you have moisture in the ground. You must have the seed, or what scientific men call a spore, and when you get a certain amount of moisture this seed or spore grows. Time is necessary, and heat is necessary, and moisture is necessary. When you get the spore or seed and you give the time for it to grow, and you get the temperature or moisture, then you have mouldy cheese. (Applause.)

REPORT OF INSTRUCTOR GEORGE McDONALD.

District. The District that was assigned to me was the Northwestern part, comprising the following counties: Huron, Bruce, Perth and Waterloo. There are seventy-six factories in all, four of which were not in operation, and two made butter all summer.

Instruction. I made regular visits to ten factories, making from two to four visits each. I spent thirty-two days giving instructions and testing milk in the factories. I spent twenty-three days among the factories, canvassing and getting acquainted with the cheesemakers and factorymen. I had very few applications from the factorymen to give instructions, as the season was favorable and the prices good.

Milk Testing. I tested 1625 samples with the Lactometer and 195 samples with the Babcock tester; the richest was 5.2, and the lowest 2.4.

Prosecutions. One man was fined for skimming his milk and pleaded guilty, and the Directors settled with him. Two of the factories that I visited were paying for milk according to quality.

Condition of Factories. All the factories that I made official visits to were clean, and everything in good shape, as far as the cheesemaker could control things. Some of the factories that I called on were in bad shape, some of them being a very poor excuse for a building to make cheese in, and giving a maker a very poor chance to make good cheese.

One thing I paid particular attention to was the way some makers move around in their factories. They seem to be putting in time, and letting some other fellow do the work, and the other fellow doing the same, and so on. Now, this should not be the case. Now, I like to see a cheese-maker moving himself and keeping his eye on everything, and keeping things moving, and when it comes to stirring curd, go at it and stir it as if he were going to stir it until he had everything right before he left it.

Quality. The quality of cheese had been very good this year, as far as I had a chance to judge. Everything was favorable in my district for making good cheese, good grass, plenty of good water and cool nights.

Sanitation. Regarding sanitary conditions of factories; a few were very good, most of them fair, and a few very bad on account of bad floors.

Whey. The system of returning whey in cans is still going on. A few factories are elevating the whey tanks, which is a great improvement, for they can be cleaned much easier, but there are still a great number the old way, dirty as ever.

Curing-room. There is a great deal of improvement being made in the curing-rooms this last summer, more ice boxes being put in, and better ways of heating the curing-rooms, and better ventilation.

Factory Surroundings: I would advise every cheesemaker to clean up around his factory, and have things nice and tidy around. Also plant some shade trees around the factory, so that when people are passing it they will form a good opinion of him even supposing they may never see him, and if he does not stay in the same factory all his life there will be something to remember him by.

REPORT OF INSTRUCTOR ARCH. SMITH.

District. The district that was assigned to me for cheese factories comprised the counties of Wellington, Grey, Dufferin, and Simcoe, and also all creameries in Western Ontario.

Instruction I commenced work for the Association on May 2nd, and finished on October 26th, when I was given charge of the Western Dairy School at Strathroy. I made regular visits to nineteen factories. Most of them applied for three, and some for four visits. On account of the great distance between a number of the factories, much time was lost in travelling. The time that was not employed giving instructions to makers was spent in visiting the creameries, in order to become acquainted with the butter-makers, and to explain to them the objects and benefits of the Association.

Milk Test. I tested 2485 samples of milk with the Quevenne lactometer, and 380 with the Babcock test. The poorest sample received tested 1.2 per cent. of butter fat, and the richest sample tested 5 2 per cent. of butter fat. The milk delivered at the cheese factories of my district, was of better quality than that of the previous year, owing, no doubt to the high price of cheese, which encouraged the farmers to produce more milk and of a better quality, and also to the excellent pasture and cool nights.

Prosecutions There were eleven persons prosecuted for furnishing deteriorated milk, who were fined from $5 to $10 and costs, each. One of the cases, which had been tried before two magistrates, was appealed, when the judgment was reversed, owing partly, I think, to the indefinite evidence given by an expert, from which the judge could take two meanings.

Care of Milk. I believe that the man who adds a small quantity of clean water, or removes a portion of the cream, is no greater criminal than the one who neglects to take proper care of his milk, and delivers it at the factory in a tainted gassy condition, as he not only robs the other patrons by deteriorating the quality of cheese or butter produced, but also injures the reputation of the maker as well as that of the factory.

Cheese Factories. I am pleased to state that the proprietors and managers of the cheese factories in my district are making an earnest effort to improve the condition of their factories, by paying more attention to drainage and sanitation, by elevating the whey tanks so that they can be more easily cleaned ; the putting in of cement floors and by adopting methods of controlling the temperature of their curing rooms, which have a marked influence on the production of a better quality of cheese.

There was only one cheese factory in my district which paid for the milk according to the quality. The whey from each factory was returned to the farmers in the milk cans. In a number of cases the whey was left standing in the can so long that the acid had eaten the tin off the iron, making it almost impossible to clean the can properly, and the result was, that the milk was given a peculiar and objectionable flavor which caused the maker a great deal of trouble. The only remedy I know of for this is to purchase a new can, and wash it immediately after it is returned, or leave the whey at the factory.

Creameries. I am sorry to say that the creameries are not being improved as much as they should be, particularly in the way of equipment and sanitation, or in providing suitable store-rooms which can be held at a low temperature for storing the butter in. A great number of the summer creameries are being run on the cream gathering system. This necessitates an abundant supply of cold water which is oftentimes allowed to run over the floor, or in open gutters, and has a tendency to keep the room damp and prevent the churn and butter-worker from becoming dry, and the result is that they soon become foul smelling. The remedy for this is to conduct the water away in pipes, and also attach a hose and a steampipe. After the churn is thoroughly washed, close the lid and insert the end of the hose in the butter-milk outlet, and then steam thoroughly for twenty minutes. The intense heat will destroy all germ life, and leave the churn dry and clean. This is also an excellent device for steaming the butter worker and utensils, and also the cans or tanks used in drawing the cream.

The quality of the butter made at the cream gathering creameries (with one or two exceptions) was not equal to that of the separator creameries, for the reason that the flavor of the butter was oftentimes determined before the cream was delivered at factory, partly on account of it having been poorly cared for by the patron.

It is my opinion that the quality of butter from cream gathered creameries will never reach the standard of quality that it should, until farmers adopt the use of hand separators, which would not only lesson the amount of labor at home, but would enable the farmer to obtain more butter fat from his milk, and the cream would be of a better quality. It could then be kept in better condition, and delivered at the factory perfectly sweet. The butter-makers would then have it under their control, and, by pasteurizing or the addition of pure cultures, a desirable flavor and a more uniform product made, which would not only sell for a higher price, but would add considerably to the reputation of Canadian butter and also to the profits of the farmers.

To be successful in the manufacture of cheese and butter requires not only a thorough knowledge of the business, but also a very close attention to the work, and now that we have so many expert makers, and an excellent system of cold storage, I think that it rests principally with the farmers to maintain and promote the reputation of Canadian dairy produce, by taking the best possible care of their milk,

Mr. McFarlane : How much would you allow a farmer for 100 lbs. of whey, if left at the factory.

Mr. Smith : When the whey is left at the factory, it is sold for so much per ton of cheese. In some cases it is sold much higher than others. It varies all the way from four to eight dollars a ton for cheese ; usually five dollars.

Mr. McFarlane : We netted this summer twenty-seven cents per hundred pounds.

Mr. Smith : I claim that is more than most farmers make from skim milk.

A Member : Will that gentleman tell how he makes that twenty-seven cents per hundred pounds from his whey.

Mr. McFarlane : The way I can make twenty-seven cents out of it is : I feed it to the cows back again ; I feed it warm. Cheese sold this year about eleven to twelve cents a pound, and I got three pounds more of cheese out of it that way by feeding it.

Mr. Smith : Mr. McFarlane states that by feeding the whey to the cows he enabled them to give enough milk to make three pounds more cheese than they otherwise would have done, and that is how he gets twenty-seven cents per hundred pounds for his whey.

Mr. Ballantyne : How do you know with such certainty the exact results ?

Mr. McFarlane : Because I do it all myself. (Laughter.)

Mr. Ballantyne : That does not prove it. You can only know that positively by carefully conducted experiments.

Mr. McFarlane : If you send that much more milk, and get that much more cheese, you know it. If you come down to my place I will show you how to do it.

A Member : I think the whey should all be left at the factory. It should be fed to pigs, and not brought away at all.

ADDRESS BY HON. THOMAS BALLANTYNE.

There was put into my hands since I came in a programme of the proceedings, which happened to be the first I have come across, and I can say that possibly I am the only one present who was at the first meeting for the purpose of organizing a Dairy Convention in Canada. That meeting was held in the year 1868, in the town of Ingersoll. I happened to be present, and I have had to do with these conventions more or less ever since, and for a long time I actively had to do with them. I have always felt that if there was anything I was specially proud of, it was my connection with the dairy business of Western Ontario and Eastern Ontario, and I might also say the Old Country. I have always felt that all we knew in connection with dairying we should not only be willing but anxious to communicate to others. Every pound of poor goods we manufacture diminishes the value of our products. It is important to improve the quality, and I have always felt that it was one of the industries in which it was more blessed to give than to receive. Great changes have taken place since the old days. At that time we had no liberal Government (I am not speaking politically, but I mean in the sense of giving us liberal contributions) to carry on this great work. We were new at the business. We did not know what to do or how to do it. We were groping our way in the dark. The work of trying to educate the makers generally de-

volved upon a very few, and we were largely indebted to our American neighbors in the state of New York. In those days we thought they knew everything about it, and that we had everything to learn from them. I am glad to say they always responded, and the best men they had were always available. There is no reason why that should be continued forever. We began to have those who were intelligent enough, and who were willing, to make comparisons, and do the best they could, and the result was the time came when Americans had to take a back seat. Hence we found at the Centennial Exhibition at Philadelphia we took the lead. Some of the cheese we exhibited there from Canada were pronounced to be perfection. We had distanced them completely. In '78 and '79, in connection with the Annual Dairy Display in New York, when they had dairy displays from England, we out-distanced them, and we then got a reputation for our goods. One reason was that we were never tempted to adulterate our cheese. Professors Arnold and Willard came over to tell us that we could use adulterations and that it would take an expert to tell the difference. As everyone knows, I had something to do with directing the policy of the Association at that time, and I rushed to the front of the platform and said : "It is true one man might do this in one factory, but ultimately you will destroy your trade," and I urged upon them not to adulterate their cheese. I afterwards gave evidence before the committee of the New York State Legislature, and emphasized the same thing. We have never been tempted to adulterate our cheese ; we have never tried to make wooden nutmegs. We have never tried to sell our cheese for anything but what it is, and it has been a very important matter for us that we have always been honest in placing the honest product on the British market. I do not say that we have been making the improvements that we should have done. I thought at one time the question of carrying the whey back in the cans would be a thing of the past, but for some reason or other it still continues to be done, and I would urge upon you not to carry it back in the same can in which you take the milk to the factory. I would like to ask if there was a man here who was supplying milk to the people of Stratford, and if he was to take back in his can the sour, dirty whey, where is the man who would buy milk from him ? How can you expect prefect goods, if you do not get the goods in the best possible condition ? And you will never have it so, if you take back the whey in the same cans in which you deliver the milk. I have been in the habit of going to England every year. When there I take a memorandum of the goods we have shipped, and examine them, and you never find cheese where the whey is taken back, perfect. If you are going to feed pigs, commence and give them all the milk ; but don't try to manufacture dairy goods of the quality demanded to-day, and expect to take back the whey. I speak advisedly ; I speak whereof I know ; I feel we are going back in that respect, and that we are not making the progress we should.

Ontario cheese, known by the name of Ingersoll cheese, used to sell at a premium a cent and a half above the eastern cheese, but that is not so to-day. It is not because we have not experienced makers, more capable men than we used to have, but it is want of that pure flavor. You must understand that the public is getting more fastidious ever day about what they will eat. An improved article improves the consumption. Reference was made to the past season and that the quality was better on account of the nights being cooler, and one of the benefits of that has been the increased consumption. I was in England during the whole time there was a large consumption, and when shipments commenced to be 127,000 boxes a week, I said to myself "It will never stand up under that," Another 127,000 the following week : "It will never stand up under that." But it stood up under it ; it improved under it ; and why ? Because the quality was better than we have seen it for a long time, and there is no reason why the quality should not be better. It is true, of course these impurities will not develop in cool weather as they will during the warmest weather.

I remember when I was making cheese and trying to learn everything I could, I went to the expense of having a separate dish for each one's milk, out of 127 patrons, so as to detect impurities, and I found one person's milk which was longest on the road was always the sweetest. I went to see why it was. It was Mrs. Hoyle's, and she was scrupulously particular and cleanly. Her milk pails were washed and scalded, and her pans kept in the same condition ; you could see yourself in them. She was brought up in a dairy district, and knew the importance of cleanliness. We find in the new districts to-day we are getting better goods than in the old, because in the old districts they have

never got into the right method, and the lesson we have to learn above all others is Cleanliness! Cleanliness!! Cleanliness!!! You cannot urge it too strongly. Milk is a most sensitively delicate article—is the most sensitively delicate article I know of to-day. I do not know of anything that is so easily injured, or from so many causes. I have worked over a vat, and have tried to observe and learn, and at every opportunity tried to teach others. When driving in the country there was nothing gave me so much pleasure as to go into a factory, and the cheese-makers were always willing and anxious to get instruction. They were all willing to listen to you. They had many difficulties to contend with; milk coming in with no means of testing it. We had no instructors then, and I may say that we were the first to propose the introduction of instructors. I was impressed with the fact that the only way we could make any permanent improvement was to get good makers to go to the factories. The first attempt was not in all respects a success, but we were on the right track and ultimately it became successful; and if these men do their duty I cannot but believe they will find the makers willing to act with them. The best maker we have would be a better man by visiting factories and learning new methods, than he would be confined to his own factory. When a man compares himself by himself he does not know whether he is right or wrong. When there is a difficulty he does not know how to get around it; but these matters have been very much improved by the instructors. The officers are, no doubt, careful to select the best men, but above all it is the farmer that is interested in getting the best milk to the factory. The expense of manufacturing and of hauling the milk is the same when cheese is eight cents as when it is twelve. The time for extreme prices we had supposed to have past but it may not be so. You have got educated to low prices, and it was not possible during last year to believe that we would ever have high prices again. I am not going to say the extraordinary demand and high price last year was the result of quality. They had dry weather in England, and the warm weather increased the consumption of cheese, and the old cheese did not overlap the new. However, we will have an opportunity of testing next spring, because there is no question the stocks are light, and we will see whether they will be willing to eat cheese again in England at the same price. If they eat to the same extent they used to they will have to pay a good price.

ADDRESS BY MR. A. F. MACLAREN, M.P.

I must congratulate you on having so very good an attendance at this first session of the Association annual meeting. Mr. Ballantyne told you that as the first afternoon was usually only a small meeting you had the popguns and pistols to speak to you, and for that reason they have trotted out the wheelbarrows first and that we will have the steam engines to-morrow. I was very glad indeed to see Mr. Ballantyne come in, because I happened to be the only one of seven presidents here before he came, and I was afraid I would have to speak for seven, when, if I spoke a half an hour for each, it would take nearly four hours and I would not like to keep you here that long.

This is an agricultural country. At the present moment, I consider we are in the centre of or surrounded by the very finest agricultural country that is to be found in America, not even excepting Leeds. As I understand it, about forty-five per cent. of the population of Canada are farmers. About twenty per cent. more of the population are engaged in handling the products of the farm, or making machinery used on the farm, the dairy, etc., such as plows, harrows, reapers, mowers, threshing machines, churns, presses, engines, boilers, separators, and all kinds of machinery used in connection with this wonderful agricultural business. In other words, I might say from sixty to seventy per cent. of our people depend directly or indirectly upon agriculture for a living. Think for a moment of our great natural resources, and then you will see whereon Canada's prosperity depends. As nearly as I can estimate, the fisheries alone yield, annually, twenty-three millions to twenty-four millions of dollars. The mines, mining coal included, yields thirty seven million dollars to forty million dollars annually. Then take our forests—including firewood, lumber, timber, etc. As near as we can estimate they yield the immense sum of eighty million dollars. Our farm crops, say two hundred and eight million dollars at the very least. Include this with our farm products, and you will find

it will reach the great sum of not less than six hundred millions of dollars. This will give you some little idea of what a wonderful producing country we have. It is food for thought for each one of us who are actors in this great play for life, prosperity, and development of this great nation. I regret very much that the agriculturists, the farmers themselves, do not come out in larger numbers to those meetings, where they would always hear something which would be profitable and beneficial, and it is really a great surprise to me that so little interest is taken. I must say that I would like to see the farmers put more business methods into their business as agriculturists than most of them are doing. There is nothing which is produced on the farm to day that is not closely watched by those who handle the product. Let it be horses, cattle, sheep, hogs, chickens, turkeys, ducks, wheat, oats, peas, and barley; hay, straw; turnips, potatoes, cabbage; butter, cheese, milk, cream; fruit of all kinds, or anything along the line of general farm products that you like to name, and you will see the great necessity of having it, in this present age, placed on the market in the best possible shape, as the market demands better goods and will pay for better goods better prices. As we grow older and our country grows older, our people become better off and are able to pay for a greater variety of food and better quality, and it is for us dairymen, in our line at least, to do all we can to produce and ship a first-class article of butter, cheese, milk and cream; and now that we have our cold storage in our homes, in our factories, in our cars, in our steamboats, in our warehouses, in England, let us show to the whole world that we fear no foe, at least in our line of business as agriculturists, as dairymen, and as handlers of dairy products. Some of our best growers of grain go through their crops and pick out the best and healthiest heads of wheat or barley or peas to sow the following year. Now if they go to that trouble in picking out the grain that is growing to have the best seed to sow for the next crop, why should not you go to the trouble of picking out the best cows for dairy work to produce cheese and butter? If they can afford to go over and pick out the best heads of grain for the next year's crop, I think you can afford to go to work and pick out the best cow, and you will find by doing so you will make money. If a cow will not pay as a milk producer or a dairy cow, then make beef of her. If you go on these lines you are sure to win; but if you take any old cow you will find that one cow is eating the other's head off. It is a most important business, this dairy business. Let us leave no stone unturned to give it one grand lift, and each one go home determined to do a little better this year than last. Let the patron be more careful about his farm and buildings keep everything a little cleaner and tidier than ever before particularly where the milk is being handled, the cows being milked, the milk cans being washed, the straining of the milk being done. Then let the man who is to draw the milk to the factory see that he receives every can from the milk stand in good shape. If he finds anything wrong with milk, or milk stand, let him report the same at the factory, and let the cheesemaker go and make things right. If he cannot get time to go, let the director look after the matter. Then see that the man who hauls the milk to the factory has his waggon, straps, cans and everything tidy and clean. He should never use a dirty wagon platform to put clean cans on, and no good cheese-maker should allow it.

Talking about farms and buildings, there is one thing to which I would direct your attention. I noticed in New York State and many different States, that they paint their barns and outbuildings, I think it is an improvement to the barns and to the farms, and that it would pay the farmers of this country to do more painting than they do. It would preserve their buildings, and make the farms look much better. Keep everything cleaner and tidier than you ever have done before, particularly the stables where the cows are kept. Then for the cheese makers, I must say they have made great advancement during the last ten or fifteen years. There factories are very much improved, and you find cheese, cheese-maker and factory all looking better. But they can all improve more or less yet, and I hope every one here will go home and think out some way whereby he can assist in the grand elevation of the whole dairy business of Canada, during the coming year, as there is room and we must keep to the front. It is no use talking,—the United States are coming after us hard—and look at Leeds. Of course their cheese are no better, but they get better rates of freight, and therefore, get better prices or more profit than we do.

There is another matter that should come up good and strong at this convention, and should be discussed very freely by the shippers of cheese, butter, grain, pork and all simi-

lar lines of produce. We must do something to reduce the rates of freight, as it is simply monstrous, simply terrible, the price we have to pay for even shipping a car of cheese a few miles. Why, you can get almost as good a rate on a car from Chicago to Montreal as you can from here. Some way must be found to solve the question of cheaper transportation for the produce raised by the farmers of Ontario. It is all very well and all very nice for the Government to assist the farmer or the agriculturist by giving him cold storage, by assisting with Farmers' Institutes, Fat Stock Shows, Poultry Associations,—all kinds of reports on all this good work—but why not do some more good work along the line of cheaper transportation ? Let us have better rates. Let us lay our produce down in England and give the men who do the work a greater profit. I care not what Provincial Government may be in power, I care not who the Dominion governors may be, let them get to work, and by land or by sea give us cheaper rates, if cheaper rates are possible. Figure it up for yourself, producers of grain, pork, beef, fruit poultry, cheese and butter ; see what a few cents per hundred pounds saved on all the above named foods would amount for the farmers of Ontario.

I have a few figures to give with regard to our shipments during the past season. At the present time it is estimated that in Ontario we have invested in cows, lands, factories, apparatus, etc, used for dairying purposes, over $175,000,000. Milk produced in one year, 350,000,000 gallons, valued at $50,000,000. Exports to Great Britain from Montreal, from the 1st May to the 1st November, 1899, 451,050 packages of butter, shipment of cheese 1,896,496 boxes. We naturally feel proud of the great advancement we are making and I think we have every reason to feel pride in the great showing we have made during the past few years. In 1894 the shipment of butter was 32,055 packages ; in 1895, 69,644 ; in 1896, 157,321 packages ; in 1897, 220,252 packages ; in 1898, 280,000 packages ; in 1899, 451,050 packages ; an increase from 32,000 to 451,000 from '94 to '99. In cheese, 1894, 1,712,715 boxes ; in 1895, 1,710,756 boxes ; in 1896, 1,726,726 boxes ; in 1897, 2,102,985 boxes ; in 1898, 1,9000,000 boxes ; in 1899, 1,896,-496 boxes.

These are immense shipments of both cheese and butter, and bring in a large sum of money to the country, and we certainly should not allow anyone to pass us in this race. Our butter will bring $2,5000,000 more than in 1898, for increase in quantity and price. Cheese will bring in about $2,000,000 more money than we had last year, and when we season's make of butter and cheese have come forward, the farmers will have more money than in 1898 by $4,500,000. If they can go to work and decrease the rate of freights upon the products, they can make another saving, and I certainly would like to see something done in this western and northwestern part of the country, whereby we may get cheaper rates for our goods. It costs a lot of money to ship a load of cheese from Wingham to Stratford, leave alone sending it to Montreal.

COUNTY HEALTH OFFICERS.

By Dr. P. H. Bryce, Toronto.

Through the kindness of your President and Secretary I have been permitted to address you briefly on a subject, which in my official position I have had something to do with during the past eighteen years, and regarding which some of your officers two years ago appealed to me to take action. I refer to the sanitary condition of your butter and cheese factories, and the various problems associated with the production of good milk. When it is remembered that there are in Ontario some 1,187 cheese factories and creameries, some 6,148 school buildings, and some 3,000 hotels—apart from the 500,000 private dwellings, distributed over 44 counties and districts, and situated in 750 municipalities—it will be evident to you that the Provincial Board of Health, with but one executive officer and one laboratory man, has a tolerably large field of operations to supervise in even the most perfunctory manner. Some two years after the organization of the Provincial Board in 1882 the Public Health Act was passed by the Legislature, making it compulsory upon every municipality, apart from the counties, to have a Local Board of Health. Last year 568 were reported to the Pro-

vincial Board as having been appointed by the Councils. Others doubtless were appointed but not reported. In rural municipalities and urban municipalities having a population of less than 4,000, the Local Board consists of five members, two of whom are the Reeve and the Clerk, and these boards reported 479 Medical Health Officers as having been appointed, along with 150 Sanitary Inspectors.

I think all will agree that this is quite a large array of Medical Health Officers, and I am glad to be able to say that much good has resulted from their work, as seen by the fact that of the common preventable diseases dealt with under the Act the deaths were but 1,502 in 1898, as compared with 2,700 in 1892. These results are all the more remarkable when I state that the salaries paid to Medical Health Officers in 1898, gathered from 285 replies to a circular sent out amounted to $6,923 for 55 towns, and in 108 townships only $1,888. I find further that during the period from 1882 to 1898 105 public water supply systems in our cities, towns and villages have been established, together with 45 sewerage systems To show the effect of this sanitary progress, I find that the deaths from a single disease, typhoid fever, dependent so directly upon these, has decreased from 600 per year in 1882 to 300 in 1898 I further find, too, that public sentiment is sufficiently alive in many rural districts as to cause the Local Boards to act with promptitude in stamping out diphtheria and smallpox—sometimes, perhaps, made more prompt from the mandatory powers placed in the hands of the Provincial Board for compelling local action and municipal expenditure, which otherwise the Act provides may be done by the Provincial Board at the municipality's expense. Doubtless, too, there has been a very general advance in the minds of the public with regard to the preventable character of these diseases, and a general improvement in the sanitation of habitations.

Why then, it may be asked, have we seen within the last three yeears deputations to the Government from commercial travellers demanding its interference for the improvement of 3,000 hotels of the Province; and why some of your members have asked of our Board that your factory inspectors be clothed with powers as Provincial Sanitary Inspectors to compel sanitary improvements in the factories?

The reason is, I think, very evident. Local Boards of Health are composed of average citizens without any special scientific knowledge enabling them to deal with the many scientific problems of construction of houses, stables, drains, wells, school buildings, cheese factories and sewage disposal; and even if they had, and though Medical Health Officers are appointed and often Sanitary Inspectors, no money in any degree adequate for carrying on their work is voted; and while there is power for them to get money when contagious disease breaks out, there is practically very little ever granted or asked for for routine sanitary work. Besides, the municipal councils take good care that if a Board attempt to enforce the compulsory clauses of the Act in abating a nuisance in the case of some offending ratepayer and voter, the two active members or officers of the Board will find their usefulness ended with the year. This as applied to the sanitary conditions of cheese factories is understood, when we know that shareholders of these are often, indeed usually, members of the Council or the Local Board of Health, and by virtue both of their official position and their supposed interests are in their own judgment the most competent judges of sanitary conditions.

Naturally, I have examined with much interest the reports of your annual meetings and of your inspectors, and I find in them from year to year the same story as I find in every other department of my work, that the problem of how to deal with the organic filth of the stable, of the milk house, of the piggery and the slaughter-house and of the factory is perennial, and if one is to judge from the reports it is as far from solution as ever. I further find it the unanimous opinion that hundreds of thousands of dollars are annually lost to the producers, to the merchants, and to the Province from this one preventable source alone.

For years past I have studied the problem, and year by year the conclusion has increasingly forced itself upon me that there can be but one satisfactory solution of the difficulty, viz., that of appointing for each county or electoral division a permanent Medical Officer of Health, a trained bacteriologist and chemist, at a living salary, and who shall devote all his time to the sanitary supervision of his district.

Let us see what there would be for such an officer, paid we may suppose as much as the County School Inspector for the district is paid. Let us assume that there is one

such officer in each of the old settled counties, and that in these the 1,187 cheese and butter factories are equally distributed. Each officer would have 296 to supervise. He would have, further, in his district at least 100 public schools to oversee, spread over an average of 12 townships. We thus see that one such officer would have a rather full day's work for every day in the year. The Public Health Act now provides that a Sanitary Inspector be appointed in each township. Such a Medical Health Officer through these would have his work so systematized that through them and the school teachers he would early learn of outbreaks of contagious disease in any school, and would, during the winter months, when these outbreaks mostly occur, give his time especially to to this branch of his work. On the other hand, it is, as we know, the hot summer months in which organic decomposition is most rapid, and the evils resulting therefrom are greatest about our busy cheese factories. Such an officer would then be free to devote practically all his time to this important part of his work.

What would he do? Primarily he would examine closely the construction of the floors of a factory, for all of the evils due to the putrefaction of organic filth about a factory, none for a moment equals in extent that resulting from such filth decomposing beneath the floors of a factory. I do not need to more than point out that material from the washings reaches this area daily, and owing to the absence of free air currents develops the most dangerous of bacteria,—the auerobes; and that currents of air due to the warmth of the building will bring them up directly into the factory. Such conditions he would order to be remedied at once, or the factory would be closed as producing dangerous food products.

Having had good concrete floors installed, he would at the same time see that their construction would be such that the floor washings would flow naturally to a trapped drain, so constructed that it would carry, as a small tile drain does, all the materials to a good distance, to be there disposed of by sub-surface irrigation tank and tiles—as we now cause to be done at the many summer hotels in Muskoka, where the sewage from hundreds of persons is dealt with daily. He would next see that a good whey tank, properly constructed, covered and ventilated, was placed to receive all the whey as rapidly as it was drained from the vats. If, as in the case now a-days, many factories have a small steam engine installed, there need only be a pump for delivering this to the elevated tank, there to be kept from putrefying by a steam pipe, if it be not removed daily. I need not speak of the economy in preventing putrefactive changes taking place in this whey from the standpoint of its quality as food. That is evident; but from the standpoint of keeping the air of the factory sweet.

I have noticed, too, in the papers and discussions at your sessions, the one point constantly to be dealt with, that of the ventilating of the curing-room and keeping it at an equable and low temperature. Such an officer, however, informed as he would be in the principles of heating and ventilation, would be able to advise the adoption of methods well known to members of the Association in these two particulars. Their cheapness has been pointed out at all your meetings, and the fact that the value of cheese, to the extent of several cents a pound, may depend upon the temperature and ventilation of the curing-room, would be a matter readily brought within the compulsory powers of the Act relating to the production of wholesome food. Every little while health officers are made aware of cases of severe poisoning here and in Britain, from the products of putrefactive decomposition in cheese, and there is but one place to prevent the occurrence of such, viz., during the process of manufacture of the cheese

But the work of such an officer is just begun when he has dealt with construction of the factory. He will assure himself, by analyses if needed, that the water supply, a necessity in good cheese-making, is of the first quality. Time and again in the past year has the Provincial Board had brought to its attention cases of typhoid in the premises of cheese factories, in some cases certainly due to contaminated well water. But he goes further; he has a sanitary inspector who under his direction, would report on the condition of every premises where milk for a factory comes from, just as our best cities and towns license dairies supplying public milk, only after inspection of their premises in the surrounding country. How necessary this is, may be gathered from the fact that in an outbreak in one of cities four years ago, I found cases of typhoid had occurred in thirty families on the route of a single town milkman who supplied 120 families. His barn well was fifty feet from the manure pile on a hill side. As a Medical Health Officer's

powers under the Act are ample to abate all nuisances of this sort, one season's work would have secured safety to a public food supply and to the farmer at the same time.

Such as I have described are some of the duties which a skilled Medical Officer of Health would perform in a work of such enormous commercial importance.

But from the standpoint of the common friend of every ratepayer whose interests are his interests, what invaluable work could such an officer perform were these matters set right.

Your agricultural chemists and bacteriologists have for years been in attendance at your meetings, teaching that the manufacture of butter and cheese demands not only technical skill, but the most exact scientific knowledge, if the highest quality of products is to be produced.

Dr. Connell and Mr. Harrison with others are working at the biological problems, just as in the Provincial Board of Health Dr. Mackenzie is studying the same problems in the relation to disease.

But what are these amongst 1,280 factories of both sorts? In the agricultural returns I find that in 1898 there were 965,021 milch cows in the Province. In this same year 93 creameries with 22,741 patrons made 9,008,992 lbs. of butter valued at $1,632,-230, or at 2 2-5 gallons of milk per lb. of butter, and utilized 20,000,000 gallons of milk in 1,187 cheese factories with an average of 65,121 patrons, who received $8,417,535 for their milk, while the gross value of the cheese output was $10,252,240. Let us assume that 75,000 are patrons of the two kinds of factories, and that as owners, directors and patrons, we assume they received $12,000,000 I find that the municipal expenditure in townships in 1898 for Board of Health purposes was $15,298 in a total expenditure of $5,742,017, while the cities spent $63,648 for Board of Health purposes out of a total expenditure of $12,432204.

The municipal census gives a population in the townships of 1,113,502 ; hence I find that roughly one family in every three of the rural municipalities sends milk to factories and gets his share of the splendid sum of $12,000,000, and of this population 375,000 pays its share of the local health expenditures, every person pays exactly 1.4 cents health tax per annum, or every family pays seven cents per annum for any assistance the Local Board of Health operations may give him in securing good sanitary conditions for his factories, or of the $5,750,000 spent in townships in 1898, but $1 in about every $4,000 was spent in Board of Health operations. It seems hardly necessary to make the absurd position in this matter as it exists at present, more ridiculous by figures. Everyone knows it.

Your Association has already realized the situation by levying a tax upon factories willing to come into the Association, of $10 a season for an inspector. They in their reports all state they did not nearly complete their rounds of inspection, and that it was almost wholly taken up with instructions in testing milk and the details of manufacture. The same story I find in reports of the school inspectors : their time is engaged in testing and investigating the manufacture of brain products, and they have no time for sanitation. If, then, we wish to make a splendid Public Health Act operative, it is clear we must have trained officers paid for administering it. With but one trained officer, as bacteriologist and chemist in each county, in the place of 300 nominal officers for the Province, paid less than $15 a year on an average, we require at least forty men not engaged in practice, the friend and assistant of any medical man of the district in diagnosing doubtful cases of disease, and in attending smallpox when it occurs ; to be further Medical Inspector of School-houses, and the one to deal promptly with outbreaks of diphtheria and scarlatina without its having to decide for the sake of a salary of $15 between offending patients and his public duty, and finally the constant adviser of the recipients of this $12,000,000 for dairy products, and this can be done at an expenditure per family in the townships, of 50 cents annually.

Shall not this Association be the first public association to urge the matter upon our Legislators?

THE CURING AND BOXING OF OUR CHEESE FOR MARKET.

By D. Derbyshire, Brockville.

You have no idea, sir, the great pleasure it is for me to face your Association, and particularly so this year, on account of the large amount of first-class work that has been accomplished by this Association. I can heartily congratulate you and your fellow directors on the great improvement that you have made in your cheese and butter this season. I feel considerably like congratulating the dairymen of our whole country on the marked improvement that we have made this last year on the quality of our butter and cheese. It is very easy for one to sell a really first-class article, but it requires quite a skilful salesman to sell something of an inferior quality. Tonight I would like to draw your attention to some of the points where I think we can make some improvement in 1900. Although we have had such a successful season in 1899, and have made such a large quantity of cheese, 2,400,000 boxes, of which were shipped from the 1st of May to the 1st of January, 1900, about 16,000 boxes less than we shipped the year before, yet we received 2c. a pound more on account of being a better quality, of course the market being better as well; but I lay stress on the fact that the quality of the goods was better, which fact brought on account for cheese in 1899, two million dollars more than we got in 1898. Now I think that is a big thing to be able to say, and I believe we can make more than two million dollars improvement in 1900 provided we can get all our people to unite heartily, on this the first month of the year, in doing the very best possible in connection with our Dairy business. I believe there is not a solitary person in this audience who, if he would take the pains to increase the quantity and quality of the cheese he makes, could not put it on the market in a finer condition than that he made last year. The United States has ruined its trade through being dishonest in sending out cheese and butter marked "first class," but really "drugged." Cheese factories should be improved and their drainage should be properly looked after, as well as their other sanitary conditions. Cleanliness is one of the greatest of virtues in making cheese or butter, and should be strictly enforced. Boxes should be of proper and regular size. Care should be exercised in transporting boxes to the cars in order that the cheese should not become tainted. If cheese were hauled to market in a wagon which had been used for hauling coal, no wonder if the value of that cheese would become depreciated. In order to make the best butter and cheese, the best cows should be kept, in the best stables, and the best and most suitable feed should be given them.

Every producer should try to make his own factory the best in the country. He should encourage the cheese-maker and co-operate with his neighbors to accomplish this one end. Mr. Derbyshire discouraged the system of endeavoring, through tendering, to secure the cheapest maker, overlooking whether or not they were getting the best maker. He then went on to give a picture of the internal and external appearance of an ideal cheese factory, where the curing-room was such that the temperature was always under control; where the refuse was done away with in the same manner in which it would be in the home by domestics, where the surroundings of the factory were adorned with trees to absorb the poisonous vapors and gases, and where that horrible smell, too often an accompaniment, was unknown. Speaking of the economy of having a perfect factory, he said that in a factory of say 3,000 boxes a year, $330 could be saved in shrinkage by having an up-to-date curing-room, while $200 more could be saved in quality, thus making a saving in one season of more than would pay for the entire cost of the erection of the curing-room. He was delighted at the changes that had taken place in 1899, but, with the beginning of the new year, he hoped to see the inauguration of more permanent changes. He hoped to see that the people of the country would show that they have greater faith in the permanency and stability of the dairy interests, and, as a consequence, that more brick factories, where temperature could be better controlled, would be erected. To-day Canada exported $25,000,000 worth of cheese. Next year they could make it $30,000,000, but they must exert themselves, for there will be keen competition with Australian and New Zealand producers. He felt that the two Associations must work hand in hand to stimulate the work, for stimulation was needed, else the country would fall behind. They must demand clean, ventilated cars, so that we can deliver cheese in a fresh condition, mild in texture, rich in body, such as is appreciated by the British consumer. Great assistance had been given in the past years as a result of cold storage, and

by the Ontario Agricultural College of Guelph, of which latter there was no better in the world to-day. But the greatest changes lie in the patrons themselves So long as they persisted in sticking to the old factories, and to the old ways of doing things, there would be no change for the better, but he felt that in the approaching of the twentieth century, Canada would uphold her reputation in the cheese and butter markets of the world. I feel we are going to be right up with it, and that in 1900 we will have the finest goods on the British market, and receive more money than we received this year.

THE FARMING OUTLOOK FROM THE STANDPOINT OF AN OBSERVER.

By Andrew Pattullo, M.P.P., Woodstock.

In appearing before you this evening, in spite of the kindly words of my friend the President, and of some old and kindly faces that I see before me that I remember very well at former meetings of the Association, I feel very much like making, if not an apology, at least an explanation or confession, and telling you that I do not feel at home in appearing before you to-night. In the first place, it is somewhat difficult to speak after my friend Mr. Derbyshire, who, as you know, is the professional beauty of the dairymen of this country. (Laughter.) And again, it is very hard to follow a man who not only looks like Mr. Derbyshire, but who speaks as well as he does. My embarrassment is increased in the glare of these beautiful lights. I come from the sweet rural seclusion of Woodstock, where we have not got such a building as this. We have a building there that I would scarcely like to describe to you. When I looked over the programme to-night and saw the number of distinguished names, I said to myself, "Why, that is easy, I will never be missed, and of course it won't be necessary for me to say anything more than a word or two" Then my friend Mr. Hatley, the Secretary, made matters worse by writing on the envelope he sent me my invitation in stating "we have only sixty-three essays on cheese and butter making," so of course I thought that was only another channel to let me out, and therefore I am afraid I have come before you to night not prepared to give you much solid matter. I fancy one of the reasons they asked me to address you was out of courtesy to the old Presidents of the Association. I have consented to say a few words upon what I regard the farming outlook in the Province of Ontario, in the Dominion of Canada, from the standpoint of an observer, and let me say here in the beginning that I am not a practical farmer, although brought up on the farm until I was of age, and have made a life study of some of the phases of farming, yet I do not speak to you with the authority that many men in this audience before me could, but sometimes, perhaps, others can see us better than we can ourselves. I am glad to see so many of the younger element of the dairy farmers present, because I am able to speak to them in a spirit of hopefulness with reference to the farming outlook in this Canada of ours. Some years ago, through causes which I do not need to go into, there was a world-wide depression in which we shared. Things over which nobody in this country had control brought about in Canada a period of distress which was felt in other countries as well as ours. That period made an impression upon me which I have never forgotten. I may tell you that for the first time in my life I almost despaired of the future of the Canadian agriculturists, because I heard so many young men say that there was no future for them any longer upon the farm. Allow me to say that I am not one of those who believe the farmers grumble any more than any other people. They do a little of it, and I suppose we hear a great deal of it because their calling makes them so dependent upon the weather. At that time there certainly was a very great deal of grumble among the agriculturists of Canada. One instance that impressed itself upon me was a gentleman who occupies a very high position in this country, no less a person than the Minister of Agriculture, in a public address gave some figures with reference to the chattel mortgages which had been given out by the farmers of Ontario in a few years, and which startled the country. They certainly produced rather a gloomy effect upon me at the time. I mention these facts for the reason that I believe, for some years past, things have been steadily improving upon the farm, and that the outlook for agriculture is certainly very satisfactory. This is important, not only for the farmers, but for the city people as well. During the past few years, from days of gloom we have been rapidly advancing into days of prosperity, and I may say with reference to

the things that have brought this about, that I do not think all these things are of our own making. I do not think we of the Dominion have control of the things which have made us prosperous instead of being as we were some years ago. We have been extremely fortunate. Farm values have increased in the Province of Ontario, in spite of the opening up of the West and the throwing of great blocks of new land into the market. I observed the other day that this year no less than one-half million acres of land has been plowed in Manitoba more than there was last year; yet at the same time and in spite of the opening up of the West, there is a steady increase in farm values in the Province of Ontario, and there has also been a steady increase in the profits of the farm. Some years ago a stock-breeder of Ontario said that he thought the stock business had about passed out of the hands of the people of Ontario—that the great ranches of the West had destroyed it—but I venture to say there is not a stock-breeder here who does not feel that the prospects of the live stock trade in the Province of Ontario are to-day extremely bright.

My friend Mr. Derbyshire made one observation which recalled to my mind the importance of the value of organization in connection with agricultural matters. He referred to the necessity of having better freight rates. It is not many years ago since freight rates for stock between here and the North-west were almost prohibitory, but, through the organization of the live stock associations, these rates have been very greatly reduced, and are now regarded as fairly satisfactory. There is a lesson in that for this organization. Not many years ago we heard nothing about Canadian pork in the British market. We have made marvellous advancements since that time, and now one of the chief sources of profit to the Canadian farmer for many years past has been the raising of hogs, one of the by products of dairying. The production of pork is of enormous importance. I believe, after closely watching this great industry for many years, that the farmers should know how to breed the right class of hogs, to know how to feed them economically, and that they can and will take hold of this industry and make it very profitable. Now let me touch upon one or two other branches of Canadian agriculture, which encourages me to great hopes for the future. We sometimes despise the little Canadian hen, but it has made more wealth to the people of this country than you think. A few years ago, everybody thought that that bird would have to go out of business on account of the tariff in the United States. We were told that the Americans had smashed the egg industry of this country. Why, sir, you cannot smash any industry that is in the hands of an Anglo Saxon people. (Applause) The only effect of the rather unneighborly conduct of our neighbors was simply to make us determined to find some way of putting our goods upon the British market in perfect form, with the result that to-day the egg industry is extremely prosperous. Connected closely with the production of eggs is the production of chickens. I remember some years ago hearing a public man in this country speaking, and somebody asked what his business was, and received in a contemptuous way the reply, "Why he is a chicken farmer," as if that were about the smallest thing on earth. Now let me tell you that I know of no direction in which the young men can do better than in the production of chickens except, perhaps, in the fancy cow business, and if I can induce some of the young men who loaf around the towns and cities of this country doing nothing, if I can induce some of them to go out into the country and become chicken farmers, I would be one of the greatest patriots in this country. In the town of Woodstock, during the past few weeks, some of the papers were poking fun at my friend Professor Robertson, for starting an experimental chicken-feeding establishment down there. The idea of the Government teaching the Canadian farmer how to feed chickens, as if the wives and daughters of the farmers had not known that years before! But do you know that small experimental station has had a wonderful effect. They collect five hundred or a thousand chickens there and feed them, and the farmers' wives go in to see how it is done. And this feeding station has had a profound effect upon my mind, for I am sure it will lead to a great development of the industry of breeding fowls in that district. A curious thing happened in connection with it the other day. A gentleman down there, who is well known as a feeder of turkeys, came up and got a lot of pointers from this Government station. The returns from the station have been extremely good. He sent home a lot of birds fed exactly after the instructions of the Government, and he wrote on the wing of one of the turkeys sent over to England these words, "This turkey cost me two dollars and so many cents; will who-

ever eats it be good enough to write and tell me how it turned out, and how much he paid for it?" A lady in England wrote back saying, "I paid for this a guinea, and something over," so the breeder thought somebody must have robbed him. Now there was no robbery about it. I am telling you that for a practical purpose, and the lesson in this, there is absolutely no limit to the market in England for fowl that is properly bred and raised, and properly fed, and properly killed, and properly shipped at the right season. Not only can hundreds, but millions of dollars be added to the wealth of the Province of Ontario every year, simply by breeding chickens. (Applause). That is one of the reasons I say the farming outlook of this country is bright, and I say it for the purpose of inspiring the young people of this country with hope in the future of the country, and of leading young men to stay upon, rather than to leave the farm.

Now I am not going to discuss how to make butter or how to make cheese. I have made it a rule of my life, never to talk in public on a subject to people who know more about it than I do myself, but I do want to make a few observations in reference to what I have seen in connection with the butter industry. I am a publisher, closely in touch with the farmer. Coming from the farm as I did, it was a matter of amazement to me some years ago to see the quality of Canadian butter. I could not have gone out and taught anybody how to improve it, but I knew very well it could be improved, and ought to be improved, and I knew that the farmers' wives of this country were losing hundreds of thousands of dollars, and that the country was losing millions of dollars every year by making bad butter instead of making good butter. Let me tell you a little incident in connection with making butter which happened some years ago when the travelling dairy was started. Two ladies were discussing it and one said to the other, "We had better go and see what it amounts to." The other said, "What is the use of doing that, as if a number of young professors from the Agricultural College can teach farmers' wives about making butter." Her neighbor went, and she got a lot of pointers from these young professors from the Agricultural College. She put them into practice, and a few weeks afterwards they drove into the market together, and took their butter to the grocer who had been in the habit of buying it. He looked at the butter in surprise. It was done up in parchment paper, and he said "Mrs. So and So, I will give you three cents a pound more for that butter than I have ever given you before." The other lady said, "Well, I am glad that butter is up in price three cents" He looked at her butter and he said "Oh no, it is not up in price at all, it is only the difference in quality. I cannot give you any more than before." There is the whole story. The creamery men upon one side had been teaching you how to make butter, and that little travelling dairy did a good deal in another direction. I will tell you how I, as an observer, know that the people of this country are making better butter than they did, and it is this. I remember not so many years ago that butter used to be brought in, or rather what I used to regard as the old "axle grease of commerce" used to be brought into the market, done up in cabbage leaves and cloths of uncertain age, of course always nicely washed. At the same time the butter did not look well. That is the way I remember butter in my early years. Now how do they do it? Done up in beautiful rolls, uniform in size and protected by parchment wrappers. Some years ago I got a pointer as to how I could buy parchment paper cheap, and nobody else in this country seemed to know how to do so except a few wholesalers. We started in and bought a few bundles of this parchment paper. One farmer would come in and get it as a great curiosity, then it grew a little, and, in a year or two, what do you think occurred. We in the little town of Woodstock in my business were ordering this butter paper by the ton, direct from the mill in Germany, where it is made. Could you have a greater object lesson than that? It means that all the farmers' wives in that district, were putting up their butter in a proper way, and that these men in the creameries and others who have been teaching the others in this country how to improve the value of their butter have been increasing the profits of the farmer to hundreds and thousands of dollars, and yet we are only at the beginning of the butter trade. Some years ago we were supplying 42 per cent. of the cheese to England, and only 2 per cent. of their butter. There is a market in England for everything the farm can produce, provided you produce it of the first quality.

Now, ladies and gentlemen, I shall not dwell upon the subject of cheese, but will say this with reference to some observations of my friend Mr. Derbyshire, that I share with him his regrets as to the failure of the effect of work done by these associations. I have

attended these associations in years past, and heard words of practical wisdom and knowledge, and I have wondered why it is that there should be a single pound of poor cheese made in the country, and yet the great unsolved problem of the dairy business in Canada is, how to get at the men who most require to be got at. I do not believe many of you require teaching, but if you could go out and get at the patrons of the factories, get out on the side-lines of this country, and convert them to the sound gospel of dairying, then there would be a revolution indeed. How to do that is the problem you have to solve. They say the chain is never any stronger than its weakest link. That weak link in the dairy business to day is that, while there may be ninety patrons who won't send bad milk or watered milk, who won't send milk that will make bad curds, there may be one or two or half a dozen in each factory who will; and the men who do that spoil the produce of the whole factory, just exactly as the men who pack apples fraudulently, have been destroying what might be a great and profitable trade of this country. I am sometimes inclined to thank kind Providence when I hear of old cheese factories burning down. One of the things that stands against the cheese industry in this older part of the country is the old factories with all these unsanitary horrors underneath. They do infinite harm and create infinite loss, while new districts, starting and taking the advantage of your experience, have actually gone ahead of you. Now, in conclusion, I want to say what I regard as two or three great problems of the Canadian farmer to-day. I believe the outlook is bright, and that there is a hope for the young farmer in Canada. What are the problems to be solved in order to have success in the future? First of all you must produce the best and only the best in every line. The farmer who goes along in the old way is out of it. Just now we are watching two nations in a death-like struggle in a certain part of the world, a struggle which thrills our British blood, as it never was thrilled in my day, nor probably in yours. (Applause.) But let me tell you there is just as big a contest going on outside of war, as there is on the battle field between the nations of the world, between you and your neighbors, between the people of this country and of New Zealand and other lands. What is it? It is an industrial contest in which those who win are those who are the most progressive and the most enlightened. You have the markets of Britain to day, but you may not have them ten years hence. Others have them in some respects to-day. You can take them from them, as you have done in some directions during the past few years. Will you do it? You can only do it in one way. If you send cheese, you must send the best cheese that can be produced. If you send butter, you will ruin your reputation if you send bad butter, or anything but the best butter. If you send fowl, you must suit the fancy and the taste and the desire of the British people. You cannot shut out the light in these days. These are days of education not here only, but in the United States, and in every other country in the world. What you know to-day, somebody in some other country will know to-morrow. The men from Denmark, or from the United States, will slip into your gatherings here, and take away all that you know; and he will spread the light there. You cannot shackle the brain in the end of this 19th century. What is the lesson? Simply to realize once and for all that you have to fight it out, and that you can only fight it out on the lines of progress. There is another problem you have to solve in addition to that, and I have hopes for the future, because the public men of this country are determining now as they never determined before that it must be solved. I refer to the question of transportation. (Applause). That is one of the problems of the future, how you can get it cheaply, quickly and in perfect form, on to the markets of the world. Mr. MacLaren can tell you how zealous the men of both parties at Ottawa are, and I can speak for those of Toronto, how zealously the men of both parties are taking up this problem to-day, demanding that it shall be solved. A good deal has been done during the past few years in providing better accommodation on steam-boats and railway lines. We are not entire masters of the railways, but we have a good deal of influence over them, and I hope we shall have more. If we could go back a few years, previous to the time we gave them such great subsidies, I think we could give them in such form as would give us some more substantial control over the freight rates than we have now. You must, as Canadian farmers, keep this great question in view. I shall not dwell upon the subject of cold storage because it would take too long.

I desire to touch upon the question of agricultural education, and this meeting right here is one of the best educational meetings I know of. With the agricultural college I

include the experimental farms of the Dominion Government. I say at these meetings and through associations of this sort, is where the education of the Canadian people is going on. I do not take so much interest in the institutions which turn out doctors, who are already in too large numbers in this country, and lawyers without most of whom we could get on very well. I think these gentlemen should be left to get their professions and to attend to themselves, but I am profoundly interested in the education of the boys and girls of the Canadian farm, and in the Canadian workshop, and unless we make their education the supreme object, we are entirely wrong. I am glad to see that the Government is beginning to realize that we are getting more practical. We are getting admirable books now upon agriculture. I do not think we could adopt agricultural education in the public schools, in such a way as to make boys and girls farmers, but I hope to see, in the future, young men and young women who come from Guelph, from the various departments of that college, utilized in public schools. Instead of forcing the boys and girls away from the farm, we should endeavor to teach them to love the farm, and remain on the farm, where, I say with perfect assurance, there are more chances of success than there are in the towns and cities of this country to-day. I should like the teachers of this country to take the boys and girls of the public schools out into the fields and unfold to them the beauty of nature, teach them something about the flowers and about destructive weeds, teach them about insect life, teach them something about the soils and what we can produce from the soils; in other words, teach them something that will be useful to them and by which they can make their living; teach them love of the farm and of rural life; and teach them the dignity and honor of labor instead of the reverse. (Applause) If we do that, I believe we will advance the future of Canadian agriculture, which though now bright will be brighter still in days to come. We are just now beginning to realize what a glorious country this Canada of ours is, what a variety of resources we have. We talk about our great timber resources and, though there is no doubt we have the best remaining timber of to-day, and that will last us for many generations, yet the timber will pass away. You know that the towns and villages which were depending upon the timber in the old sections of the country have passed away. They same may be so in the future. We know that the fishery wealth of the country may pass away, because it may not be kept up. We also glory in the fact, that in this new Ontario of ours we have untold wealth of gold and silver which we propose to develop, but that may be dug out after a while and may to some extent pass away. The same thing may be true of all our vast resources of pulp wood and our vast resources of nickel. All these may be only temporary. But I tell you of something that is not temporary, but is eternal. The great source of wealth of this country, which will never pass away, is the farm, it is the land. (Great applause). In England, land which has been cultivated for a thousand years, produces more to day than it did a thousand years ago. And so it is with the Canadian farm I say to the boys of this country, stick to the farm; and remember that that is the real source of wealth for the people. I say the prosperity and future of this country, and of every country, depends on its one eternal mine of wealth, the farm. As a young Canadian, I have perfect faith in this country. I believe in its resources. I believe in its destiny. But if you asked me to say in a single word why I believe in the future of the Canadian people, I would say it is, because we have a population unsurpassed in the world who are of the farm; who believe in the farm; and who are adopting progressive ideas upon the farm. I believe in the future of Canada, I say, because I believe in the Canadian farmer and the farm. (Applause.)

DAIRYING AND ROAD REFORM.

By A. W. Campbell, Provincial Instructor in Road Making.

It is with great pleasure that I appear before you, especially when I have been asked to follow the gentleman who is the father of the road reform movement in this country, Mr. Pattullo, who has so ably addressed you here to night. About five years ago, I believe it was, when he first asked that this agitation be put on foot for the purpose of discussing whether or not the condition of the common roads of the country were as good as they could reasonably be expected from the amount of labor and money which wer

spent upon them, whether or not the system under which our roads were being made was as good a system as could be adopted, and, if not, to lay down some system by which these roads could be made. I think the time has arrived in this country when, owing to changed conditions, a changed method for the making and maintaining of our common roads is necessary. We are all aware that under the present system much work is being done, much labor being wasted, much money being practically squandered, and that the results are by no means consistent with the expenditure. At a convention held in Toronto it was considered advisable that the County Councils of our Province should be given control of the main leading roads in every county, and that the money which is now being spent upon these main leading roads by the Township Councils should be collected in one common fund, and that the money should be deposited in the hands of the County Councils and should be spent by them. That the making and maintaining of the roads in the townships should rest in the hands of the Township Council. It was also recommended that requests be made to the Provincial Legislature to assist, as well as might be in their power, by way of appropriating money to the County Councils to assist them in improving and properly maintaining these roads. Such a requisition as this is before you to pass upon. It may be objected to by local Councils that the Township Councils are in as good a position as the County Councils to maintain these roads; that by placing these main roads in the hands of the County Councillors greater taxes would be levied, and for that reason increased burdens for road purposes would be levied. But I can assure you, by a careful study of what roads are really costing you at the present time, that it is a lack of system that is causing such poor results for the amount of expenditure. We are well aware that the statute labor system has many very commendable features. It is a system which naturally appeals very warmly to the majority of ratepayers in the townships who have had to do with the building and maintaining of roads from the time the law was enforced; but, with changed conditions, changed circumstances and changed requirements, I think the time has arrived when we should make some change in the system of keeping up the roads that would give us better results without in any way increasing the expenditures upon them. The statute labor system is a system which I believe at one time performed a service which could not possibly have been performed by any other system in this country, when the country was a wilderness and sparsely settled, when the people had no money to spend upon roads, when they were obliged to cut down trees, corduroy the swamps, and bridge the streams and do all this work by their own labor. Then I think the statute labor system was a proper system to adopt, and I believe it was as good a law as was ever written upon a statute book. But, sir, the manner in which the statute labor was performed in those days is so entirely different to the manner in which it is performed to-day that it has almost reduced itself to a farce, and has become the laughing-stock of the progressive farmers in Ontario. It is not surprising to find that last year we spent about a million days of statute labor upon the roads of the Province of Ontario, and that in addition to this the Municipal Council spends about three and a half million dollars of money annually by making appropriations from the general funds of the municipalities. In the last ten years there have been spent upon the common roads of the country about ten million days of statute labor, and in addition to that about thirty-five millions of money. I have frequently said that if I was given these thirty-five millions dollars of cash and ten million days of statute labor, with authority to impose a proper expenditure of that labor, amounting in all to about forty-five million dollars of money, that I would undertake to gravel and macadamize, in a first-class manner, every rod of road in the Province of Ontario. Has this been done? It has not. And if it has not been done, then, gentlemen, there must be something very faulty about our system of expenditure, and as this fault exists is it not in the interests of the people that we should, in an Association of this kind, look into this expenditure and see where the weakness lies? In the county of Perth, in which we now stand, I find that at the present time there is being expended 33,200 days of statute labor, in addition to which in this county, there is being expended out of the general funds of the municipalities $33,150 in cash. This money is taken from the pockets of the ratepayers. It means only about one-third of your annual tax bill in the county of Perth. The total expenditure of money and labor is $66,651, which for the last ten years has been spent upon your roads. It amounts to an expenditure of nearly three-quarters of a million of dollars. I ask you who are acquainted with the

condition of the roads, whether or not they have improved in this county in the last ten years, and, if so, have they improved in keeping with the expenditure of nearly three-quarters of a million of money? In the county of Middlesex I find that the expenditure there has been in the last ten years 55,000 days of statute labor, and in addition to this 750,000 dollars of money—in all in that time an expenditure of 1,250,000 dollars. I happen to be familiar with the roads in that county, and can say that, previous to the last ten years, all the main roads in the county were constructed by the County Councils or by toll road companies. Since that time many of the lateral roads have been gravelled and improved with an inferior quality of material that will not stand heavy traffic, so that in the spring and fall these roads are very often axle deep in mud. Now, sir, with that expenditure of over one million and a quarter dollars upon the roads of one county, which is a very small section in this Province, I contend that the improvement is not in keeping with the expenditure. Heretofore we have considered this question of road-making as one of little importance, one not worthy of consideration, but when we come to find that the expenditure through the Province is greater than the total expenditure of the Ontario Government on its schools and public institutions and every other class of work it maintains to-day, then surely to goodness it is of great enough importance to spend at least a few hours per annum in considering and looking into. Is there any person in this audience who can tell me what the system of road-making is in the county of Perth at the present time? At the first meeting of the Township Councillors they appoint from 80 to 100 path-masters to work on road-making. They provide these men with no plans or specifications or instructions. They are simply asked to go out upon their respective beats and do the work according to their best judgment, secure as much work from the individual farmers as they possibly can, and have it performed in the best possible way; and you find one hundred different ways of making roads. One man believes in a narrow road and makes it 15 feet, another one 20, another 30, and another 40. The next year these men are dismissed and a new lot of men appointed, and the man of this year believes in a wide road where the man of last year believes in a narrow one, and so the work is thrown away. In the county of Perth each year you appoint 856 path-masters. You change them every year so that in the past ten years, leaving out a number who have not been changed, you have had nearly 7000 path-masters directing the road-making in this county. I contend it is utterly impossible and hopeless for you to expect to reap permanent, substantial, and and economical results until you have reduced this work to a business basis and have laid down some proper plan for the guidance of these people.

The question of road making is a simple one. It does not require any particular engineering skill, or the service of any great experienced people to direct this work, but it does require that your Township Council should arrive at some definite plan of action, and that they should lay down that plan and follow it. I contend that it is the duty of the Council to classify these roads. About one-third of the roads are main roads, subject to traffic by the whole community, which require to be made of a wider grade, and require to be built in a more expensive and substantial manner. Another one-third are by-roads, leading to the main roads, used only by neighbors. They do not require to be made of such liberal width or built in such substantial manner. Then another one-third are back concession roads which are subject to very little traffic and do not require such expensive treatment as the main roads. The first thing to do is to classify these roads, and lay down a plan. The main road should be 24 feet in width, the next class 20, and the next 18 feet. I have always contended that a rise of one inch to the foot from the centre to the side at the edge of the ditch is sufficient. This makes a road 24 feet in width, 12 inches higher at the centre than the side, and I contend that that grade should be made uniform. Now, then, with nearly three and a half millions of dollars spent in the Province each year on our roads, we find that the major part of this money is spent on leading roads to keep them in passable condition. A lot of time is thus wasted under the system of the statute labor. Just about the time the taxes are due, the farmers in some neighborhood ask to have some improvements made on their road, and they turn out to perform the work and you know how it is done. Not as you would perform the work, but as men who are more anxious for the money than they are for the improvement, do the work. They turn out with horses and waggons which would not be accepted by the contractor of any work. They haul loads of gravel, a wheelbarrow full and a half instead of a yard and a half, of material which is not fit to be put on the road. In this

way the money is being squandered, and in this way work is being neglected, and the best results are not being produced. Now then, if we get the leading roads constructed in first-class shape, they will serve as an object lesson for the construction of the remainder of the roads, and I contend that by placing these main roads in the hands of the County Councils, they can, if they purchase first-class material and have them properly built, and have the work done in a business like manner, easily construct one hundred miles in each county, and have it constructed at a very much less cost than the cost of maintaining these roads at the present time. Township clerks have sent reports to me showing the amount expended in the last fifteen years upon leading roads, and the returns show that the cost of these roads is greater per mile per annum than the cost of maintaining some of the best roads in England or France at the present time. In the County of Hastings they have done the work in a systematic manner, and have made great improvement. I will make this proposition in connection with the County of Middlesex, I will undertake to take over 150 miles of road in that county to-day, and will, in the next ten years, without increasing the expenditure one dollar beyond what they are spending upon them at the present time, macadamize every rod of that 150 miles in the most substantial manner. The conditions in Perth are the same, and, from the reports I received, I will stake my reputation that if you to-morrow place these roads in the hands of the County Council and they transferred them to me, I will simply collect the money that is being annually spent upon them during the past ten years, or that they will spend upon them in the next ten years, and I will macadamize from end to end 100 miles of these roads. I have made that proposition in I suppose 40 counties out of the 50 in the Province. I make it here, and I make it knowing from the reports I have received that this money is being squandered and wasted for the want of proper methods and proper supervision and the use and application of proper material. I am not paid to come here to try and deceive you. If it is found that I make a statement that cannot be carried out, then, by making the proper representations to the department that employs me, my head would go off inside of 24 hours. But in the interests of the people I come out and am not afraid to make this statement, knowing that it is true. I contend it is for you, and for similar representative bodies, to wait upon Mr. Putullo and Mr. MacLaren and other representatives of the people and say to them, "If you have money for the purpose of assisting in the construction of railways and canals and other work, and if you can possibly spare it, we think in the interest of the farmers in this country, you should assist to some extent in the improvement of the roads," and I would net be surprised but what your requests would be granted. But I fear that the Legislature are of the opinion that the farmers do not thank them for the assistance that they give to them.

It has been referred to to-night that the question of transportation is one of the greatest problems before the people of this country to-day. I indorse that statement fully. I contend that it is in the interests of the farmers in this country that they should see that the products of the farm are taken from the farm to its ultimate destination in the least possible time at the cheapest possible rate, and in the best possible condition. In this connection steamboat companies are enlarging the capacity of their vessels, are spending enormous sums of money in increasing that capacity, and in increasing the speed; and the Government has spent millions of dollars of money in the improvement and enlargement and deepening of canals and harbors. Railway corporations are spending millions of dollars in lowering grades and in making roads hard and smooth, and while all these corporations are spending this money, surely it is for us to pay some attention to the improvement of that more important part of the system of transportation, the common roads that lead from the farm to the railway depot. What would be the use of these railways and canals if it were not for the common roads of the country, and it is to this branch of the work we should devote our attention and make the greatest improvement. I believe in removing every obstacle from the machinery of transportation, and I do believe the greatest clog is the bad condition of the common roads of this country. (Applause.)

Hon. Thomas Ballantyne: One of the most difficult matters we had in connection with the starting of our factories was the question of our roads. It is a live question to-day, I know nothing of more importance, and I think the scheme Mr. Campbell has outlined is the very best thing we have heard about. I hope every one of you will go

away impressed with the importance of this subject. There is another matter of great importance, and that is cleanliness, and I hope you will insist upon that.

Moved by Hon. T. Ballantyne, seconded by D. Derbyshire,—

That, in view of the fact that the Agricultural returns show that in 1898 75,000 patrons supplied milk to 1,280 Cheese and Butter Factories in Ontario, the value of whose output was some 12,000,000 dollars ;

That, in view of the fact that the four Inspectors of this Association continue to report annually that milk from many of these patrons is sent to the factory in a condition as regards quality and cleanliness which materially decreases the value of the output of the factories ;

Further, that inasmuch as the Annual Reports of the Inspectors show the sanitary condition of a notable number of factories to be such, in the matter of construction of floors, curing-rooms, etc., and in the disposal of the sewage and whey as to cause a notable depreciation of the manufactured products ;

Be it therefore resolved, That this Association does hereby affirm as its opinion that the the time has come when at least one scientific medical health officer, trained especially in Bacteriology and Sanitary Science, should be appointed in each County of the Province, whose whole time shall be devoted to the oversight of the public health of his district, and especially of farm premises whence come these milk supplies, and of all the factories where they are manufactured into butter and cheese ;

And to this end does hereby instruct its Executive to bring this important matter before the Provincial Government, with a view to having amendments to this end made in the Public Health Act at the next session of the Legislature.

That is the resolution I have much pleasure in submitting to you. The question of health is in its infancy in this country. They have made great advancement in the old country. It would pay us forty times over, in the improvement of the dairy products of this country, if such an officer were appointed with power to put the necessary machinery in operation to enforce it.

Mr. Derbyshire : **I believe this resolution is in accordance with the best interests of the dairymen of this country.**

The resolution was carried.

THE EFFECT OF LIME SOLUTION IN CHEESE-MAKING.

By Prof. H. H. Dean, Ontario Agricultural College, Guelph.

Before I take up my subject proper I wish to make a few introductory remarks on some points relating to dairying. I have done what I have never done before when addressing the Association, I have written a paper. It is a technical subject, and you can always handle a technical subject better in the form of a paper than you can in the form of an address. A number have come to the dairy convention expecting to hear something new. Now, it was said by a very wise man that there was nothing new under the sun, and so all that any speaker can do is to present old facts in a new form. I have attended the Dairy Association for ten years and I have found it a very difficult thing indeed to get anything that is absolutely new, in fact it is almost impossible. I have heard some complain that it is the same old thing every year ; but we need to be continually brushing up our ideas so as to stimulate us to do better work.

If there is one thing which characterizes the twentieth century it is the forward movement in dairying. We cannot afford to rest on what we have done in the past. One of the speakers last night referred to the fact that there was a great struggle going on among the different classes. In all life it is a struggle for the survival of the fittest, and in all dairy work it is merely a struggle for the survival of the fittest, and the fittest men and the fittest women are those who are going to survive in the struggle. In the coming century it is for us, as dairymen, to prepare ourselves for the issue in the best possible manner. If we are going to survive the struggle which is going on about us, we want to get the very best men possible in our cheese factories and creameries, and I hope the time will not come when our best men will grow discouraged. I am going to refer to one thing which I am sorry to see growing in this country. It is to some extent copying from our American friends. They have very many good things under the Stars and Stripes, but there is one thing which I think we would be very unwise to follow. I refer to the practice of manufacturing butter and cheese on Saturday night and Sunday.

In a short trip around our factories I find this to be a growing evil, but I hope we shall take measures to prevent the spread of that thing, and not on sentimental grounds at all. I believe it is an inborn principle in man that he shall rest one day in seven, and I ask you how are we going to keep our best men in the creameries if we work them from 5 in the morning till 8 at night every day, and then on Saturday night and on Sunday. This is a free country and men will not put up with that sort of thing, so I hope all those who are interested in the factory will do their best to overcome the evil. The late D. L. Moody tells a story which illustrates the question of Sunday work. He says that a man was employing another man who objected very strongly to work on Sunday, and that his employer said to him, "Does not your bible say that if your ass gets into a pit on Sunday you shall pull him out? "Yes" said the man, "but, if I had an ass that was in the habit of getting into a pit every Sabbath day, I would either fill up the pit or sell the ass." Now, sir, it has come to the point in connection with dairy business, that we should fill up that pit or do something to the men who are responsible for this Saturday night and Sunday work.

In connection with testing, the question was asked yesterday why it has not been more generally adopted in chesse factories and creameries in Ontario. I will tell you why. There is a suspicion among the patrons that either the test is not right or that it is not properly operated. I think the system of testing the milk in cheese factories and creameries in this Province will not become general until you do something to remove that suspicion. During the past season a great many letters and samples of cream have been sent to our department for testing, because the patrons were suspicious that the testing was not properly done. We will never be able to do much on that line till we remove that suspicion. How can that be done? Last week I had the privilege of attending the State Dairymen's Association in Vermont, when I met a number of keen, sharp Yankees who had made a study of this subject, and who had brought pressure to bear on the Government in the State of Vermont, and now they have a law which requires that every operator of a Babcock test in cheese factories and creameries, where money is divided according to test, must have a license from the State Experimental Station Agricultural College. I don't know whether we have reached the point in this country where we are prepared to pass such a law as that. I certainly think it is a move in the right direction. Mr. Hill, who has charge of their dairy school, told me that out of those who had applied for a license thirteen per cent. proved at the examination that they were wholly incompetent to operate the Babcock test, and that, therefore, these men are not allowed to use the instrument. They go further, they have a State law which says that all the glass work in connection with the Babcock test must be branded by the experimental station. Very many of the bottles sent out to our cheese factories and creameries are not correct, and I think it is time we had something to insure the correctness of the test. I believe the time has come when we should have a disinterested party doing the testing at our cheese factories and creameries, unless the operators of a Babcock test can show they are fully competent to use the instrument. Last year I suggested that we might have a disinterested party in charge of a central station where samples could be sent and tested. I think until we do something to remove the suspicion in the minds of the patrons it will be very difficult for us to introduce the testing to any great extent. I am sorry to admit that, in the Province of Ontario, instead of the testing being more generally adopted I believe it is being less so each year.

Another point I wish to refer to is, it is necessary in connection with our cheese factories and creameries that they should have improved drainage, and an improved manner of cleaning the drains. I don't think we can emphasize that too strongly.

A great many of the makers complain about the patrons being dirty with the milk and not taking proper care of it, but I can scarcely see how makers can have the nerve to say anything to their patrons about cleaning the cans, when the patrons visit their cheese factories and creameries and see that the factories and utensils are not nearly as clean as they ought to be. And there is no excuse for it. If there is any one thing in connection with our dairy school work which we try to drill into our boys, it is that they must keep things clean and tidy, and I believe our boys do make an honest effort to try and keep things clean. In some factories it is impossible. The maker does not own the factory, and he cannot afford to put in floors, or to improve the drainage.

I hope the time will come when the maker will be part owner. I approve of the principle of one of our makers who stipulated he will no longer engage single men, but would have only married men working for him. That means that a man will be anchored to one spot. I am afraid that we have in our factories too many of what we might call "Floating Curds" who are not anchored in any one spot. Now, on the question of cleanliness. I read recently of a colored preacher who was asking for a collection. He was a pretty cute old fellow and he said, "Now, brethren, we are going to have a collection this morning for foreign missions" and he said, "for the sake of heaven don't let the person who stole Widow Johnston's chickens last week put a cent on the plate." Now, any men who have not their cheese factory cleaned in a first-class manner, don't for the sake of heaven say anything to the patrons till you get everything cleaned up yourselves.

I believe it is possible, without any large expense, to improve the drainage about our cheese factories and creameries. As to floors, there are two materials which I prefer; first, cement floors. If properly laid there is no doubt about it the cement floor is the most durable floor, most easily cleaned, and the least likely to get out of order, but if it is improperly laid, it is one of the poorest floors possible. Of wood material, I don't think there is anything better than the best selected pine, but it needs to be properly laid. The pine should be put together with white lead, the whole floor thoroughly soaked with a mixture of linseed oil, turpentine and driers. On our own floor we use one gallon of oil, one pint of turpentine, and one pint of Japanese drier. On a new floor we give it three coats. These floors should be coated at least once every year. By doing this you prevent the water getting into the wood, and the floor will last longer. It does not cost much. Just take a whitewash brush and put in a handle about as long as a broom handle. It is surprising how quickly you can go over a big floor. You can go over a creamery floor in less than an hour, and the expense will be less than a dollar. These floors, if properly looked after, will last a long time.

One word about drainage in cheese factories and creameries. I find that in using drains lined with galvanized iron they soon become useless, because the iron gets eaten out and the dirt gets in under it. If I were making a wooden drain, I would take a solid piece of timber 8 x 8, give it the necessary slant and then connect with your drain outside. If you are using well water, you should use sewer tile for taking the sewerage away from the factory. If you use ordinary drain tile the ground soon becomes filled with sewerage from the building and gets into the well. If your factory is near a spring, I am satisfied you can best handle the sewerage by a filter bed; for an ordinary factory a place about twenty feet square and about two feet deep, using the dirt which comes out of the ground for building up the side, then fill in from three to five feet of gravel and sand. Put in the bottom under the gravel one row of six inch ordinary drain tile. It has been proven that water which comes from sewerage filtered through such a bed as that is perfectly harmless. The bad germs have been taken out through the process of filtering, and the water which runs away from such a filter bed may go into a creek or stream and cause no harm at all. I hope there will be some strong movement made to improve the drainage from our cheese factories and creameries. If you have not a proper filter bed, I would recommend running the stuff into a tank, use alum to precipitate the solid matter and then pump out the liquid. I would like the boys in cheese factories and creameries to bear in mind that although this past season has been a very favorable one for the manufacture of cheese and butter, and the price has been extra good, the probabilities are that next year they will need to use extra precaution, because we find that a good year is usually followed by a bad one. You will probably remember in 1898 a number of our boys suffered severely on account of the slow markets, and that a large quantity of cheese was rejected, for they had to put up a lot of hard money. We have not had to contend with anything of that kind in 1899.

Now to my subject proper. In all experimental work, time is needed, and you require extensive proportions. Whenever you set out to find what are the results from any particular line of work you must make all conditions equal. If you mean to find out the effect of the percentage of fat in the milk, you must make all other conditions as nearly alike as possible. Experimenters are apt to draw hasty conclusions, because they have had certain results from one single experiment that they have not thoroughly sifted. The more I look into this question, the less inclined I am to lay down any hard or fast rule. Our bacteriologists at the College have found that there are eight or ten different

germs which cause gas—probably there are 100. I hope this Association will bring pressure to bear on the Government so that we will have one bacteriologist who will devote his whole time to the dairy matters. Our bacteriologist has enlisted and gone to South Africa, so we have no man in connection with the College now. These are problems that would take up the whole attention of one man. My paper is a very short one, because our experiments have not yet been extensive enough to settle very definitely any of the questions to which I shall refer. Part of the work was done by our own cheese-makers, part of the work by Mr. Hutcheson, one of our third year students. The work is in what may be called a tentative stage.

Effects of Lime Solutions in Cheese-Making.

Lime consists of the metal calcium united with oxygen. Calcium is a light yellow metal having an affinity for oxygen. Pure lime combines very readily with water, giving off great heat, and falling to a white powder known as slacked lime. Slacked lime is but slightly soluble in water, one part of it dissolving in 730 parts of cold water.

Carbonate of lime (chalk), sulphate of lime (land plaster) and chloride of lime are other forms of calcium commonly known. According to Solner, calcium exists in milk in the form of calcium phosphate, calcium citrate, and calcium oxide in combination with casein in the proportion of 100 parts of casein to 1.55 of calcium oxide. According to the same authority the calcium oxide is not dissolved in the milk, but is held in suspension. When milk sours, or is coagulated by means of an acid, the lime is separated from the casein and the insoluble casein forms the curd. When rennet coagulates milk, it acts on the casein splitting it into two compounds—a soluble, which passes off in the whey, and an insoluble, which forms the chief part of what is commonly known as curd. Rennet also precipitates the calcium phosphates of the milk, and causes the curd to mechanically hold the milk fat. These phosphates are lost when milk sours, or is coagulated by acids.

Under the influence of high temperatures the lime salts of milk are changed, and owing to the close relation existing between the curdy matter of milk and the mineral constituents, anything which affects these salts also affects the caseous compounds. The Pasteurization of milk for cheese-making renders the curd mealy, flaky and crumbling in nature, and it does not become "meaty" as is the case with ordinary curds. (See samples.) The cheese also lack body and texture as a rule. It is claimed that milk which has been boiled again becomes susceptible to the action of rennet by treating the milk with calcium chloride, or other soluble lime salt. One authority says "I am unable to substantiate the statement of authors, that boiled milk is far more difficult to coagulate than unboiled milk."

In our experiments at the O. A. College we have found that the milk which has been pasteurized does not coagulate so readily as the unpasteurized. The addition of calcium chloride to the pasteurized milk did not render coagulation less difficult, though our experiments are too few to admit of any definite conclusion on this point.

Experiments conducted by Dr. Hillman of Germany in 1896, indicated that valuable results were obtained by adding 0.1 per cent. of calcium oxide in the form of chloride and phosphate. He estimated an increased yield of cheese equal to a value of 2½ cents on 220 lbs. of milk in making skim cheese, and 8½ cents per 220 lbs. of milk in making whole milk cheese. He recommended a larger amount of lime salts for milk from cows advanced in lactation. He also suggested the addition of lime to milk which had been pasteurised for cheese-making.

"The Dairy," London, England, recently summarized experiments made in Germany, on the effect of adding calcium chloride to pasteurized milk for cheese-making.

"The Dairy" reports, "the yield of cheese was in all cases greater where the calcium chloride was used than in the experiments where the chloride was not used." "The use of the chloride was also found to restore the ability of milk heated to boiling point to curdle."

During the past two years a number of experiments have been made at the Dairy department of the College, with the solutions of ordinary lime water, calcium chloride solutions, and a mixture of the two. These solutions have been used with both normal milk and milk which had been pasteurized, or heated to a temperature of 160 degrees.

The quantity of the lime solution added to the milk varied from .3 to .6 of one per cent., and of the chloride there was used about .01 of one per cent. In some cases the lime solutions were mixed with the rennet for from three minutes to twelve hours before adding it to the milk, and in other cases the lime solution was added to the milk a short time before setting.

The results of our experiments may be summarized as follows:

1. An ordinary lime water solution when mixed with rennet for ten or twelve hours before the rennet is added to the milk, destroys the action of rennet, but such an effect does not result if the rennet and lime water are mixed shortly before renneting the milk.

2. Calcium chloride solutions, so far as we have observed, do not effect rennet action adversely.

3. The yield of cheese was slightly greater in several instances where the lime solutions were used, but this difference in yield may or may not have been due to the use of the lime compounds in the milk.

4. There is little difference in the quality of the cheese so far as we have yet observed, though many of them are too green at this time to enable us to judge of their quality.

5. In the case of pasteurized milk, the lime solutions did not restore the texture and body of the cheese, though there appears to be a slight improvement in the quality as the result of adding a chloride of lime solution to pasteurized milk for cheese-making.

6. Our results are tentative at present and require further work to settle the question of the effects of lime solutions in cheese-making.

Mr. McFarlane: How soon do you test the milk after the cows have been milked?

Prof. Dean: The best time is to test it within two or three hours after it has been milked, or as soon as possible after milking.

Mr. McFarlane: Which is the better, the milk which foams up in the pail or that which is at the bottom?

Prof. Dean: There is always a certain amount of air in the milk which foams up.

Prof. Farrington: I would like to ask Prof. Dean what length of time he has kept those cheese to which he has added the lime solution?

Prof. Dean: We have the cheese yet; some are two months old and some only two weeks.

Prof. Farrington: From the test you have made you think the cheese with the lime solution is fully as good quality as that to which no lime was added?

Prof. Dean: There is not any difference, or very little difference, in the quality.

Prof. Farrington: So far as I have ever read that was the one objection to adding lime to the milk. If the cheese was kept longer you don't get the same quality of cheese where the lime has been added.

Prof. Dean: We shall look into that, as we have all the cheese yet.

CHEDDAR CHEESE MAKING.

First Prize Essay.

By Colin A. Campbell, Stratford, Ont.

In considering the art of cheese-making it will be necessary to include not only the manufacture in the factory but everything which has any influence on the results until the finished product is turned out of the curing-room. The farmer, the surroundings, the cheesemaker, the buildings, the conditions, etc., are all to be recognized.

In the first place let us consider the manner of man we should have on the farm. That he should be intelligent, industrious and honest goes without saying, but he requires these qualities in a higher degree in the dairy business than in any other branch of agriculture, for the reason of the wide variation in the profits. One man will be making 20 per cent. to 30 per cent. profit on his investment, while another is losing money and will be perfectly ignorant of the fact. This great difference is brought about by the amount

of skill and care that enter into the work. Therefore I would say that the two great requisites for the dairy farmer to possess are the same as those required in any other business, namely, brains and application.

The day has gone by when farmers can afford to be ignorant. They must study, read, learn, think ; in fact the ideal farmer must be a professional man, and not a hewer of wood and drawer of water. He must be a chemist, a botanist, a bacteriologist, an entomologist, a veterinary surgeon, a mechanic and a business man. All these and other studies are open to the farmer, and some knowledge of all is necessary to his welfare. In fact no other profession offers such a wide field for the intellect, and yet we have farmer's sons overcrowding the so-called learned professions in the cities and towns.

Having procured a man with all the virtues he should possess let us look for a moment at his farm—which is of course a dairy farm. . A moist climate, good soil and plenty of pasture are necessary. We do not require a large farm, as a small one well looked after and cared for will be found more profitable than a large one which is neglected and has a big mortgage on it, as is often the case. I would recommend no fences, with the exception of those which enclose the farm, as divisional fences waste land, are an expense to keep up, and a good portable local fence will be found handy and answer all purposes.

As for buildings they should be sanitary, convenient, neat, trim, well built and always kept in good repair.

The dairy stables should be planned so that the dairy stock may be attended to with the least possible amount of labor. They should be warm, roomy and comfortable, 500 to 800 cubic feet per cow. They should be well ventilated by removal of foul air and bringing in of fresh without creating a draught. Have plenty of light and face south if possible. Sunlight is cheap, it is nature's great disinfectant, and even diffused daylight has a beneficial effect. A plentiful supply of pure water is necessary, but it should be remembered that it is for drinking and washing purposes only and makes poor cheese.

Next in order comes our stock. Keep any breed preferred but keep good ones. It need not be imagined that because a cow has a long pedigree she must be a good one, and a breed should not be condemned because it contains some poor animals. As far as my experience goes there is nothing in the dairy line so much misunderstood as the dairy cow. I have had dozens of men tell me that the Jersey cow gives very little milk, but that the quality is good. This is not entirely true Jerseys are noted for giving a large flow of rich milk, and if a Jersey does not do this something is wrong, probably the strain, and the sooner a change is made the better. I would advise all dairymen to learn the points of a good dairy cow, to study the principles of heredity, to buy and keep none but those known to be good, and in selecting a sire to look for something more than pedigree and points. Milk is your primary and final object and the record of dam, grand dam and family in general should be ascertained.

A cow should receive the best of care and attention. A good cow will respond to kindness, liberal feeding and attention to her comfort and wants in general. I would advise feeding some substance such as bran or meal in addition to pasture at all times of the year, and also the growth of soiling crops for use when pasture becomes dry. Avoid feeding anything that is likely to taint the milk, such as turnips or bad water.

All this bears directly on the profits of the farmer, and through him indirectly on the manufacturer's profits and on the quality of cheese made.

We now come to an essential point in the production of the raw material, upon the quality of which will largely depend the quality of the cheese made. This point is emphasized time and again with I fear, small results. Nor do I see how we can expect any great reform until we find some way to bring home to the farmer the weight of his responsibility. The result of his neglect should be a corresponding depreciation in his bank account.

Milk is a secretion of the mamals for the nourishment of the young. It has a specific gravity of 1.028 to 1.034 When first drawn from the cow it is both acid and alkaline in character, but the acid almost immediately gains ascendency and continues up to a certain point, when the alkaline character which has lain dormant begins to overcome the

acid, the latter having evidently worked itself out. Its composition according to the Ontario Agricultural College is as follows :

Water	87.5	per cent.
Fat	3.6	"
Casein	2.5	"
Albumen	0.7	"
Sugar	5 0	"
Ash	0.7	"
	100.00	

Water of milk is the same in chemical composition as ordinary water.

Milk fat is in the form of little drops of globules, varying in size from 1-1500 to 1-25000 part of an inch in diameter and are invisible to the naked eye. These globules are held in suspension in the liquid which form is called an emulsion.

Casein and albumen are the nitrogenous or muscle-forming part of the milk and are partly in suspension and partly in solution.

The milk sugar is in solution. It is capable of being converted directly into alcohol, and is easily changed to lactic acid by the action of at least ten different kinds of lactic acid bacteria. The effect of temperatures on the lactic acid germ is worthy of special note, as it is the means whereby we preserve the milk, and which the cheesemaker used to develop the proper amount of acid at the different stages of manufacture. On this largely depends the character of the cheese made.

The lactic acid germ does not develop below 15 degrees Fahrenheit, and increases fast from 59 to 107 degrees then diminishes and ceases at 113 and 114 degrees F. It will be seen by this that a temperature below 59 degrees F. is suitable for holding milk which is to be kept for some time.

Ash or mineral matter is mostly in solution, and consists of that portion of the milk which cannot be burned.

Milk in the udder is practically sterile or free from germs, but the moment it is drawn off it becomes contaminated with bacteria and other taints. The former come from different sources; the teat acts as an incubator, from the time of one milking to the next large numbers of bacteria develop in the milk left in the duct; particles of filth and manure adhere to the udder when the cow is in a reclining position or when wading through swamps, muddy streams, etc. These filth particles adhere to the lower end of the teat and from there find their way into the duct, where the conditions for development are very favorable. So it is that the first few streams of fore milk are seeded with bacteria in great numbers. The hairy coat of the cow is more or less covered with dry excrement, mud and filth from the stables, from the barn yard and muddy fields. A whisk of the tail or stamp of the foot, or in fact any motion of the animal or milker serves to dislodge them, and they fall into the milk pail. Dirty or dusty garments of the milker also contribute to the supply. Particles of dust floating in the air have germs attached to them and these fall into the milk. This occurs frequently in a barn where dry and dusty fodder and bedding is used. Perhaps the most common source of all is the use of unclean dairy utensils.

How, then, one may ask, are we going to keep our milk free from germs? We cannot. Nor is it necessary, as many of them are useful and we are obliged to enlist them in our service in the manufacture of both cheese and butter. What we can do however, is to reduce the number to such an extent that they will give little or no trouble, and the cheesemaker will have a chance to develop those kinds he requires and crowd out the undesirable forms.

Bacteriologists tell us to throw down the first few streams of fore milk and to moisten the sides and udder with a damp cloth, but a good many practical men take exception to this because throwing the milk on the stable floor creates a nuisance. It might also be mentioned that the majority of the germs found in the fore milk belong to the lactic acid group, and as a certain number of these are required we may safely let them go into the milk pail. As for the damp cloth, a cow should first be kept clean, after which if a soft dry cloth is used on the udder it will be found sufficient.

All vessels brought into contact with milk, such as cans, pails, strainers, etc., are a prolific source of germ life, and the most thorough scalding will not serve to sterilize them

although it will greatly reduce the greater number of germs in them. Wash with cold or warm water first to cleanse them from particles of milk, then scald or steam thoroughly. Taking the bye-products back to the farm in the same set of cans used for the milk is to be condemned, owing to the rich germ life found in these products and the filthy condition of many of the whey tanks throughout the country.

Do not buy cheap or poorly soldered tinware, as the milk gets into the cracks and crevices and is difficult to remove. It will be found a good plan to take all utensils to the tinsmith and have soldered the ears of the pails, all the joints, and any place where milk or dirt can lodge. Remove milk from the barn immediately after milking, and strain in a pure atmosphere. Aerate milk immediately after milking, and cool to only the temperature of the atmosphere. An ordinary tin dipper will do for the purpose, but there are many excellent aerators on the market, which save labor, and where they are in use the work is not likely to be neglected.

Having produced a first-class article on the farm it is ready to hand over to the maker, and we now make the acquaintance of our friend, the driver who forms the connecting link between the farm and the factory. This gentleman seems to be pretty much the same the world over, and never improves very much. Perhaps it is that about all we can tell him to do is to keep clean, and as different people have different standards of cleanliness he takes his own and is satisfied. His waggons should be supplied with springs, should be kept painted and washed, his horses should be clean, and above all he himself should be clean.

The factory, building, machinery, etc., are important, as a large part of the difficulty in making good cheese results from poorly built and poorly equipped factories. In selecting a site, it should be central, with good roads, drainage and water supply. A factory should not be built on a side road where an apparently generous patron presents the company with some marsh land for the purpose of getting the factory near his own place. A factory on a side road is like a store on a back street. It adds to the expense of hauling and interferes with the patronage. In building, foundations should be solid and framework strong. Walls should consist of a first and second wall with an air space between built of two thicknesses of lumber and one of building paper enclosed. The floors should be tight and built of hardwood or cement, and with gutters large enough to carry off all the whey that is likely to run into them. This last is an important and much neglected point, and one that I should like to emphasize. In many factories these gutters—or pipes which are sometimes used—are too small and the consequence is that the whey backs up and runs over the floor, making a sloppy factory, wet feet and other undesirable conditions.

The boiler-room should not be too small, and if possible the engine should have a separate room, away from the dust where it could be kept clean.

The curing-room should receive special attention in the shape of an extra air space, double windows, shutters, and a sub-earth duct, to enable control of the temperature. This means money in pocket when it comes to curing cheese.

In fitting up the factory get the best of everything ; besides cleanliness have an eye to the saving of labor.

The boiler should at least be a half size larger than is actually required. Engine, vats, weigh cans, scales and power curd mill should all receive attention. As for agitators, in my opinion no factory should be without them, although they are objected to by some good men. The too often forgotten wash-sink should be considered a necessity. It is easier, cleaner, more effectual and better in every way, to wash things in a sink than on the floors or in some old tub. For presses I would recommend the horizontal press with steel frame such as is manufactured in St. Marys. Water and steam for general purposes should be conveniently placed, with hose attatchments, so that all parts of the building could be reached.

One thing I want to suggest, but which I have never seen tried, is a washing machine. Many a time have I stood pounding away at sink cloths, head cloths, etc., watching the machinery overhead and wondering if it could not be made do this work. I am satisfied that it can and at a very small cost. The machine I would suggest is simply a hollow cylinder, something like a disbrow churn with half round strips nailed along the sides the length of the churn about one foot apart. This I feel sure, would do all the washing in the factory much better than it is usually done by hand.

Curd-sinks are in use in most factories in western Ontario, and I believe there is room for improvement here. They are mostly built of wood, with racks and a hole bored in one end for the whey to escape, which it does generally and runs all over the floor. This makes a sloppy factory; to say the least this is unpleasant. They are also difficult to keep clean, as the whey collects in the cracks, soaks into the wood and becomes foul and dangerous. I saw a curd-sink this summer which I thought a great improvement. It was simply a wooden frame, inside of which was set a zinc pan about the same shape as the ordinary sink, with a tap at the end instead of a hole. This is handy, as whey can be kept back until it is ready to be run into the gutters. This plan is also convenient for putting hot water under the racks to keep the curd warm when necessary.

Almost the only thing required in the curing-room is a heater. The favorite and perhaps the most suitable is one with a sheet iron covering made to conduct the heat above the cheese and distribute it evenly round the room. I might add that wood stoves are totally unsuitable and should be thrown out.

We now come to the much abused whey tank, and certainly it deserves all the abuse it gets; but I firmly believe that its construction has a great deal to do with the neglect it receives. It should be built with a view to being easy to get at and easy to clean. It should be elevated; a tank sunk in the ground is an abomination. Have steps leading up to it, a platform around it, and water and steam pipes run to it from the factory.

In the morning when the milk arrives the cheese-maker should be on hand, with his nose clear and his head level to receive it. One should be careful to give the farmer credit for every pound of milk he sends to the factory; a representative sample for the Babcock tester should be taken, and all milk that is not in good condition should be returned. Here is one of the great difficulties that any cheese-maker has to contend with. Sometimes it may be that the milk is cold, and bad odors are hard to detect; sometimes it may only be a suspicion, and even when it is a certainty he runs the risk of offending some unreasonable patron whose nose is not sharp enough to detect what the maker knows is there. About the best way out of the last difficulty is to save some of the condensed milk and give it to the patron to smell; when it gets old it will smell badly. In any case the maker should be alert, and if any milk gets in of which he is suspicious he should note its development in the vat and act accordingly.

Cheese-making is a process of fermentation from beginning to end. The most important point is knowing how to control the lactic acid.

Ferments are divided into two classes. Organized, or those in which the change takes place as the result of the presence of living organism, and unorganized, or those in which the change is caused by a chemical substance. Among the former is the lactic ferment, with which we have to deal very largely. The amount of acid developed at the different periods varies with the conditions and seasons. The amount laid down by the Ontario Agricultural College for the season is as follows, but these vary with conditions:

	Dipping.	Milking.
Spring	1-16 to $\frac{1}{8}$ in.	$\frac{3}{4}$ to 1 in.
Summer, about....................	$\frac{1}{4}$ in.	1 to $1\frac{1}{4}$ in.
Fall, about	$\frac{1}{4}$ in.	$1\frac{1}{4}$ to $1\frac{1}{2}$ in.

In order to ascertain the condition of the milk we take what is known as the rennet test, which should be taken as early as possible. By means of an eight ounce graduate take eight ounces of milk and heat in warm water provided for the purpose to 86° Fahrenheit; place a small chip in the glass as an indicator, then measure one drachm of rennet in a smaller graduate, stir the milk, then add the rennet, noting the time at which this is done; continue to stir for ten seconds, then withdraw the spoon and watch to see how long it takes to coagulate. This will be seen by the chip indicator, which will suddenly stop still and appear to start back in the opposite direction.

From twenty to twenty-two seconds is about the proper time to set normal working milk, but will vary with the season, locality, and condition of the milk.

If the milk is over-ripe it must be set as soon as possible, and if it is slow, bad flavored or gassy, it should be matured more than usual before setting. Great care should be taken at this point, as it decides the way in which the curd will work all through the process. If milk is set under the proper conditions everything else is likely

to run smooth enough. It is always well to keep a good pasteurized starter on hand to hasten ripening if required, and assist in overcoming bad flavors.

It is well for the cheese-maker to understand why it is that he adds the starter and ripens more than usual, etc., to overcome bad flavors, as a man who understands what he is doing, and why he is doing it, can work much more intelligently than the man who simply follows a rule.

The lactic acid germ, of which I have spoken before, is one of the desirable kinds for cheese-making, and is antagonistic to those forms which cause bad flavors. So it is the cheese-maker's business to introduce and encourage this class of germ, always bearing in mind that it is a good servant but a bad master; for if these germs get the upper hand the cheese is probably done for. Thus in ripening milk we are growing lactic acid bacteria, which act on the milk sugar and turn it into lactic acid, and in adding a starter we are adding millions of bacteria of a desired kind which will help crowd out those not wanted.

Stir milk gently while being heated to 86°, and when ready for setting use three ounces of rennet for one thousand pounds of milk, If quick-curing cheese is required use more rennet and less salt. In the case of over-ripe milk it is well to use about an ounce more rennet per thousand pounds, as the curd will cut quicker and that much time is gained; it will also expel moisture and help firm up the curd. If making colored cheese, use one and one-half ounce of coloring to one thousand pounds of milk, and add as soon as you get the weight of the milk in the vat. Dilute rennet in about one-half gallon of water; have milk in motion, and commence pouring in at one corner of the vat, and walk round it so that it will not all be poured into one place; then continue stirring for about three minutes.

Curd is ready to cut when it breaks clean before the finger and does not leave milky, but clean, whey in the break. Use the horizontal knife first, cutting lengthwise and taking plenty of time. Then use the perpendicular knife, cutting across, then lengthwise again with the same, and if the curd is a quick-working one it is well to cut once or twice more, as the smaller cubes are easier to cook.

Curd should be stirred gently with the hands, or with agitators, for ten or fifteen minutes, before turning on any steam.

Rough handling here means loss of butter fat, which should always be considered. Heat curd to 98°, taking thirty-five or forty minutes to do so, and continue stirring for about fifteen minutes to insure uniform cooking. If the curd is a fast-working one it cannot be handled just as one would like. "You are between the devil and the deep sea" and are likely to lose butter fat in any case. The object here is to have the curd cooked firm enough before too much acid develops, so it must be cooked more quickly, and as soon as the vat is heated up the acid may be checked by drawing off part of the whey; and if this is not sufficient, draw it all off and complete the firming by adding water. It is a good practice to heat a fast working curd higher than usual, say to 102° to 104°. It is usual to dip a curd with from one-eighth to one-quarter inch of acid, then stir sufficiently to expel the surplus moisture. Experience alone will teach one the proper amount of stirring in the sink. The better the cook the less stirring is required, as heat expels moisture. As soon as the curd is matted sufficiently to turn without breaking, cut into strips from four to six inches wide, and turn every fifteen minutes, or often enough to keep the whey from gathering, and after the second or third turn pile two or three deep, according to the condition of the curd.

Curd is milled with acid from three quarters to one and one-half inches, according to circumstances, but it is important that it should be meaty in texture and tear like a chicken's breast at this period.

Between dipping and milling one will be sure to find out if the curd is gassy, if not apparent before. If gassy, of course the maker has been working all along to get rid of it, by maturing milk more than usual, by retaining more moisture to encourage the development of the lactic acid, and using a good starter, etc After dipping, pin holes will develop, and in order to get rid of these the curd is piled before and after milling. I find more good done just after milling than at any other period, by piling curd and leaving it till it is matted again so close that it is difficult to tear it apart.

After milling, air and mature well before salting. It is ready for salting when it has a soft silky texture and smells like newly made butter. The salt should be well

mixed, and enough time allowed for it to dissolve before putting to press. It is usual to use about three pounds of salt for one thousand pounds of milk, but this is subject to change.

The question of salt is worthy of attention. Salt adds flavor to the cheese and checks fermentation; cheese without salt would cure very quickly and develop gas, while too much salt would spoil the flavor. We therefore give a bad flavored curd a little more salt to a good one. We also salt a moist curd liberally, not only because the moisture is expelled, but because the salt is thus carried off in solution.

About 84° is about the right temperature for putting to press. Make your cheese uniform in size. A pair of scales to weigh curd will be found an advantage. Tighten press slowly at first and let the whey out gradually. A small stream of brine should be kept flowing, and when this stops tighten again.

In 45 minutes (not earlier) the cheese is ready for bandaging, when it is taken out of the hoops, the bandages neatly pulled up and hot water liberally applied. After they have been replaced they should be tightened the last thing at night. First thing in the morning they should be turned in the hoops, and then left in the press as long as possible, after which they are placed on the curing-room shelves and turned every morning until ready for shipping.

The curing-room should be kept between 65° and 70° Fahrenheit, with about 60 per cent. of moisture. There are several ways of supplying moisture to curing-rooms, but none that I have heard of appear to me any better than throwing water on the floor or letting in a little steam through a pipe put in for the purpose.

CHEESE MAKING.

Second Prize Essay.

A. J. WAGG, GUELPH.

The reputation of Canada for producing good cheese, although well established, is not immovably fixed. Canadians cannot rely on the quality of the cheese produced in the past for the future reputation, even though it has been the means of placing them the foremost cheese-producing people in the world. The sooner we can get cheesemakers and patrons to realize this fact the better for the industry. With these facts before us, it is plainly evident that very great care must be exercised in order to retain what we have recently gotten within our grasp, viz., a good reputation.

It will not do for us to become careless, or stand still and rejoice in our success, for if the cheese industry of Canada is to be maintained at its present high standing we must continue to make improvements or we shall find ourselves occupying the lower position which some of our rivals now hold.

I shall in this essay only discuss the manufacture of cheddar cheese, which is the only kind made in Canada to any great extent.

Unlike the buttermaker, the cheesemaker finds that there are hardly two days in the whole season when the milk must be handled exactly alike to obtain the best results. For this reason a man cannot learn to make cheese in a week, a month, or even a year; but he requires the inborn skill of long, practical experience to enable him to handle milk judiciously to make good cheese under the varying conditions which he meets.

I believe the present methods of cheesemaking are about right, but what we are sorely in need of to-day is the carrying out of these methods. Some cheesemakers carry out the best methods in the best way possible, but in some factories the work is done in a very slip-shod manner.

Another drawback, especially in Western Ontario, is the lack of proper curing-rooms, facilities whereby the temperature and moisture can be controlled, but as this will be touched upon under the curing of cheese, we shall not dwell upon it now.

Cheesemaking starts not in the factory but on the farm with the patron, therefore it is necessary that the cheesemaker and the patron work harmoniously. The maker, who should understand all about the care of milk, should educate the patrons along that line, for without pure milk we cannot expect a good finished product.

Immediately after the milk is drawn from the cow it should be strained and then aired, either by stirring or pouring, until it rid of its animal heat. It may put in an airy place where the temperature will not fall below 60 degrees nor run above 75 degrees. Milk is better not kept in very large quantities over night nor put in cold water, except in very hot weather, or when it is to be kept over Sunday; even then, before putting it in water, it should be freed from its animal heat. Some patrons kept the milk in pails, hanging on a beam in an open shed, which seems to be a satisfactory plan. The morning's milk should also be aired, and if possible sent to the factory in a separate can.

When it arrives at the factory it should always be sampled by an experienced man man on the weigh stand, and any that will not produce good cheese should be sent home again with a note of explanation. After the milk is poured into the weigh can, a sample should be taken into the composite test bottle—that is where payment is made according to quality, and all factories should run on that basis.

In weighing in the milk the cheesemaker should give the patron the up-beam weight. The practice of docking each patron two or three pounds to raise the cheesemaker's average is one which invariably brings dissatisfaction, and should be condemned.

In spring and fall the milk comes in so sweet that the use of a starter is necessary, at least highly desirable. If a starter is used judiciously it is certainly advantageous, but if its use is abused it becomes a curse to the cheese industry. Where a starter is needed, none but a first-class one should be used, and of it not more than one per cent. The best material to use for a starter is skim-milk, but as this is not obtainable in most factories whole milk should be used. Whey is used by some makers, but as it is often badly flavored its use should be strongly condemned. If whey is used it should always be pasteurized.

To prepare a whole milk starter, select several samples of milk from your best patrons; put them into sealers which have been previously sterilized; heat the samples to ninety degrees, and allow them to sour at a temperature of about sixty degrees. From these select the sample which has coagulated into a firm, white mass, with a pleasant acid taste and smell. If a good mother starter cannot be obtained in this way, as is sometimes the case, it is advisable to procure a commercial pure culture or lactic ferment. Then take as much milk as you will need as a starter the next day, add about fifteen per cent. water and pasteurize. This consists in heating to 160 degrees and stirring continuously, allowing it to stand for twenty minutes and then rapidly cooling to seventy-five degrees. Add a small quantity—about three per cent.—of the formerly prepared mother starter; set in a pure atmosphere at about sixty degrees, and the next morning it will be sour and fit for use. Always save a little of the old starter to propagate the acid in the starter for the succeeding day. All utensils used in the preparation of the starter should be sterilized before being used.

Unless it is very cold weather, when the milk is known to be sweet the starter should not be added before a rennet test is made. By making a rennet test it can be determined whether or not a starter is needed, and if so, how much. If normal milk will set in one hour from the time it is heated up, a starter should not be used. If the milk is gassy or over-ripe use a starter if at all possible. If the milk is not over ripe steam may be applied, and the temperature raised almost to setting temperature and maintained at that until the vat is full; it can then be raised to eighty-six degrees, at which temperature the vat should be set.

If colored cheese is being made the color may be added as soon as the weight of the milk is ascertained. Pour the coloring into a dipper of milk, and draw the dipper along under the surface of the milk from one end of the vat to the other. Then stir it well into the milk. Milk should be stirred frequently while ripening to prevent fat rising to the surface. Immediately before setting the vat a rennet test should be made. It is a serious mistake to set a vat by guess, as milk will sometimes ripen faster than it will at other times. Without the rennet test being used carefully and judiciously it is impossible to make cheese uniform in quality.

The amount of rennet used will vary according to the season and the strength of the rennet. In the spring you may use from three to five ounces, and in the summer and fall from two to three ounces per 1,000 pounds of milk. This should be diluted with water and distributed evenly from one end of the vat to the other, and stirred with the milk for four or five minutes.

In cold weather it is well to cover the vat during coagulation. Coagulation fit for cutting will take place in about twenty minutes in the spring, and from thirty to forty minutes in the summer or fall, if the right amount of rennet has been used. Be careful to let the coagulum get firm enough before commencing to cut. If cutting is commenced when the curd is soft there will be a loss of butter-fat and caseous matter which would otherwise be retained. The whole mass should be so thickened that it will break clean over the finger.

In cutting, use the horizontal knife first, holding it vertically, and passing from end to end of the vat very carefully. Be very careful in inserting and removing the knife to make it cut its way through the curd so that it will not jam or bruise the curd. Then cut with the perpendicular knife once across and once lengthwise of the vat, being careful not to lap or miss cutting any of the curd. This will usually be sufficient, but in summer it may be cut once more with the perpendicular knife. In the fall some makers cut four times with the perpendicular knife, but I believe so much cutting chops the curd up too much. I believe that in the near future two sets of knives will be found in most of our factories so that when it is desirable to cut finely a set of finer knives may be used.

After cutting it is best to leave the curd standing for about five minutes before commencing to stir, as this will allow the surface of the particles to heal over so that they will not bruise by stirring. Stir gently for ten or fifteen minutes before applying any steam, being careful not to allow it to become lumpy. Then turn on the steam and cook slowly; one degree in five minutes is fast enough at first, but as the temperature rises to above ninety degrees it may be cooked faster—two or three degrees in five minutes. Normal curd should not be cooked above ninety-eight degrees, and some of the best cheese made in our country to-day is not cooked above ninety-six degrees. Stirring should continue for fifteen or twenty minutes after ninety eight degrees is reached, to insure uniform cooking, and then a hot iron test should be made. If the acid is developing too rapidly, part of the whey should be drawn off and the curd stirred well. Stir occasionally until it is ready to dip. Aim to get the curd so cooked that a handful after being squeezed will readily fall apart. The amount of acid should be from one-eighth inch in the spring to one-quarter inch in the summer and fall, and this should be obtained without leaving the curd in the whey more than three hours.

As the acid develops very rapidly at this stage, great care should be exercised by the maker in order to get the curd out before too much acid has developed. In spring it is necessary to start the whey running at one-sixteenth in acid in order to get it dipped with one-eighth inch.

In most of the eastern factories the cheese is cheddarded in the vat, but in our western factories it is dipped into a curd sink. The amount of stirring in the sink depends on the condition of the curd, but if it has been properly cooked it will require very little stirring. It is of the utmost importance to have the curd cooked properly. Too much stirring causes loss of butter-fat and loss of moisture, which will give a dry harsh texture to the cheese, without the silkiness which is so desirable. Enough moisture should be retained to keep the acid developing continuously, but not too rapidly. Spread the curd evenly over the racks and leave it to mat, being careful not to leave it long enough for pools of whey to form on the curd. When matted so that it will turn without breaking it should be cut into strips and turned. After leaving it for ten or fifteen minutes it may be cut down the centre and piled two deep if it has been properly cooked. If the acid is developing slowly the curd may be piled more as it becomes firmer. Pile every ten or fifteen minutes until ready for milling. The temperature should also be kept up until milling.

A curd is ready to mill when it becomes flaky and shows about three-quarter inch of acid in spring, and from one inch to one and one-quarter inch in summer and fall. Try to use a mill that will cut the curd into cubes of uniform size without bruising them.

Immediately after milling the curd should be stirred three or four times, and then stirred every ten or fifteen minutes until salting. Stir and air until it ceases to improve in flavor. It is ready for salting when it becomes mellow, is of a fine meaty texture and smells like newly made butter. Use the best dairy salt which you can get, which should be of medium fineness and free from impurities Salt at the rate of about one and one-

half pounds for fast curing cheese in the spring, and from two and a-half to three pounds per 1,000 pounds of milk in the summer and fall. The best way to apply the salt is through a fine sieve, scattering it evenly over the surface. Put it on in at least three applications, stirring in each before the next is applied. When the curd has become mellow again, and the temperature reduced to about eighty degrees, it is ready for the hoops. Have the hoops clean, and the press cloths smooth and clean. It is better to weigh the curd into the hoops so as to get the cheese more uniform in size. Pack well in the hoops, making the centre the firmest, as this will give a closer cheese. Apply the pressure slowly at first, to save butter-fat and caseous matter. If white whey presses out it is an indication that there is a loss of fat and casein. Increase the pressure gradually and press for three-quarters of an hour, when the cheese may be taken out and bandaged. Draw the bandage up and trim, leaving about one inch at each end of the cheese. Be sure to have the seam straight, as it shows very plainly when dry. For cap cloths the circular one may be used, but as they are somewhat expensive light square cotton ones will probably do as well. If cotton ones be used cheese should be well cured before shipping, as the cap cloths are removed when the cheese are shipped. In putting them under pressure again do not press heavily for a few minutes, as it is likely to form collars around the edge of the cheese. In the morning they should be taken out and turned. Never let a poorly finished cheese go into the curing-room ; if necessary leave in the press for two days. Cheese should be under pressure for at least twenty hours, and it is better to leave them in until you wish to prepare the hoops for the succeeding day's cheese. The modern spring-head gang press is much to be preferred to the upright wooden press.

So far, we have been discussing cheese-making under normal conditions, but the cheese maker finds that he must often handle gassy, tainted or over-ripe milk ; therefore we shall mention the main points of difference between handling normal and abnormal milk.

Gas in the night's milk can can easily be detected, but if in the morning's milk, or if the milk comes in cold, and sweet, it may pass undetected into the vat. If you find your milk ripening very slowly you may be suspicious of gas. If so, use some clean flavored starter, and allow it to get two or three seconds riper by the rennet test before setting. This will give the acid a good start, and will also allow the curd to be dipped sooner than usual. In setting use an extra amount of rennet so as to retain more moisture and to give a little more time for cooking, as it is to be dipped a little earlier than usual. Cut so as to leave the cubes larger, and stir longer before applying any steam, than with normal curd. Cook slowly to 96 degrees, and then if the acid is developing fast enough, draw off part of the whey. In stirring, keep the particles of curd apart, well, so that they will cook properly. Try to manage the curd so that at dipping it will have a little more moisture and more acid than normal curd. Just before dipping raise the temperature to 98 or 99 degrees. Dip with about one-quarter of an inch of acid.

The amount of stirring in the sink will call upon the good judgment of the maker. He should try to have his curd firm but not too dry. If he stirs too much moisture out of it he will check the acid and destroy what he has been working for. Some makers recommend washing the curd at this stage, but a better time is after milling. If washed at dipping there is a tendency to check the acid, which we want to help along.

Gassy curd should be piled higher in the tank than normal curd unless it is soft. Be careful not to allow whey to form in pools on it

Mill when it becomes flaky and shows about one-quarter inch more acid than with a normal curd. Immediately after milling it should be stirred well to get rid of the bad flavor. Good results have been obtained by washing. If it is to be washed use plenty of pure water at a temperature slightly above that of the curd. In very hot weather use water colder than the curd. It is rather doubtful if the practice of washing curds will come into general use, as it should never be done where the water is impure, and it involves considerable trouble.

Air and mature well before salting. It is customary in some factories to pile after milling, but it is not necessary if the curd has been well piled before milling. At any rate it should not be piled for two hours after milling, as this is the time to get rid of bad flavors and you cannot do it by piling. Use a little less salt, especially if the curd is losing butter fat, as most gassy curds do. After salting let it lie for about half an hour before pressing.

If the milk comes in tainted, and not gassy, as is sometimes the case, heat it up to 88 degrees, and air well by stirring and pouring. Allow it to ripen so that it will dip sooner than a normal curd, but do not ripen it so much as you would gassy milk, as the lactic acid does not have gas germs to fight against here. If a good clean flavored starter is available use a little extra with milk of this kind. When cooked to 98 degrees, run the whey down about half way in the vat. Dip with a small amount of acid. The sooner you can get the whey from the curd the better, so long as it is fully cooked. Turn often in the sink, air and mature well before salting. After salting, allow it to lie half an hour before pressing.

In the hot months of summer the milk often comes in over-ripe. When a maker anticipates over-ripe milk, he should have everything in readiness for a race with lactic acid. A good way to test over-ripe milk, to find out whether or not it should be taken in, is to heat up a little of it in a pail to about 90 degrees. If it does not thicken, you know it will stand heating up to setting temperature in the vat.

Do not apply any steam until enough milk is in sight to fill the vat. Then apply the steam fast enough to have it up to the temperature for setting as soon as the weight of the milk is ascertained and the color added. Make a rennet test to know just how fast you will have to work.

In setting, use an extra amount of rennet so that you may gain a few minutes by the quicker coagulation. Commence cutting early and cut finer than usual. Commence stirring immediately after cutting, and apply the steam as soon as you have the curd in circulation and the sides and bottom of the vat clean. You may cook an over-ripe curd faster than a normal one, as it expels whey faster. Cook to 98 degrees, draw off part of the whey and stir well. If the acid is still developing much too fast, draw off the remainder of the whey and add water to finish the cooking. This will aid wonderfully in checking the acid and in firming the curd. Acid development is due solely to the milk sugar, which is found almost exclusively in the whey; therefore, if the whey is drawn off the acid does not have a good medium in which to develop.

Dip with less acid if possible and stir drier in the sink than with a normal curd.

Mill when it is flaky and shows about three-quarters of an inch of acid. After milling, air well and hold longer than usual before salting.

When cheese are put into the curing-room they are only half made. Our present methods of curing cheese are not just what they should be. In most of our factories we cannot control the temperature of the curing-room as we would like to. I shall not here go into details concerning the building of a curing-room. The main requisites are that it should be well insulated, so that it will not be affected perceptibly by changes of temperature outside. For controlling the temperature, the sub-earth duct is becoming quite popular among our leading cheese makers, which shows it is an effective means to that end. By this method cool fresh air can be brought in from the outside, thus giving the room plenty of fresh air and at the same time keeping the temperature where it should be. Another method is by the use of ice; but as this requires a great deal of attention and makes considerable muss, it can only be recommended in case of emergency until a sub-earth duct can be built.

The ice method is cheaper, but in the long run the former method is cheaper on account of its durability and more efficient work with little attention.

Every curing room should be supplied with a maximum and minimum thermometer, so that the maker will know the extremes of temperature which his curing room reaches.

The above mentioned methods of controlling temperature will supply enough moisture to the room except where artificial heat is necessary. For supplying moisture some have recommended hanging up wet sheets, but a better plan is to keep water in the curing room in a large shallow pan. For measuring moisture, a hygrometer should be kept in the curing-room.

To cure cheese properly it is desirable to have two curing-rooms. When the cheese are first taken from the press they should be put in a room at a temperature of about 70 degrees. After about a week they should be removed to the cooler room at a temperature of about 60 degrees.

If cheese are taken from the press at 80 degrees or above and put into a room at 60 degrees, there will be a tendency to develop bitter flavors. However, if fast-curing

cheese are wanted one room will do, which should be kept at a temperature of about 68 or 70 degrees.

Cheese should not be shipped until they are at least two weeks old, and they are better if left for three weeks or a month in the curing-room. One of the greatest drawbacks to the cheese industry is that salesmen, tempted by present high prices, will ship cheese altogether too green. These will probably go into cold storage and there develop bitter flavors.

Throughout the entire process of cheese-making the cheese-maker should be characterized by having himself and factory as clean as hot water and scrubbing can make them.

In conclusion, allow me to urge all makers to have their factories put in proper shape before commencing in the spring, and to keep them so throughout the entire season. May I also urge on all factory owners the necessity of better curing-room facilities, so that we may still enjoy the enviable reputation of being the best cheese-producing country in the world.

KNOWN AND UNKNOWN THINGS ABOUT BUTTER-MAKING.

By Prof. E. H. Farrington, Madison, Wisconsin.

The statement is often heard that "What one does not know will make a great deal larger book than what one does know." This is a truism which applies to butter-making as much as it does to any other subject.

In Wisconsin we always welcome every opportunity we have for reducing the size of the larger book, and this was one reason why I was especially pleased to receive your invitation to be here.

I once heard a professor of agriculture who had taught for twenty years urge an audience of farmers to send their sons to the Agricultural College. He pleaded particularly for the young farmers. "Send your sons and your daughters" he said, and I wondered at the time why the older men and women were not also included in the invitation. This question was not asked, however, and I cannot say what answer the professor would make to it, but I do know that a teachable disposition in a butter-maker, be he young or old, is very much to be welcomed. When a man starts out with a self-satisfied idea of the training or the teaching that he has had, either as a helper to some expert butter-maker, or as a student at some dairy school, and he seems to think that this training has furnished him with all he needs to know about the subject, there is very little prospect of his advancement. A training of this kind ought to be merely the starting point of his education. From it, he should have learned how to think for himself so that he may make good progress in the future without a teacher.

The best opportunities for learning reveal to some people an almost hopeless amount of unknown things when they are compared with the little that is known.

If any one will read the 52 weekly copies of some good dairy or creamery paper he will find that what is already known about making fancy butter, is not such a formidable amount of information after all. I do not mean by this statement, that a paper will give in one year all there is known about butter-making, but the subject will be discussed and written upon by so many different people, that some information is very apt to be given on all the essential features of the process. There is one thing especially that every dairy paper will probably repeat several times during the year, and that is that with absolutely extra pure milk, a butter-maker will not find it a very difficult problem to turn out butter of quality every day. This, of course, is assuming that he understands the influences which different temperatures have on milk and cream, and that he has had some practice in the manipulations of skimming and churning.

At the present time enough is known about butter making to predict with considerable accuracy the quality of the goods that will be made under certain conditions. Defects in butter can generally be explained, and a fancy quality can now be depended on in something more that a haphazard way.

Since this is true, it must be admitted that ignorance of what is already known about butter-making is the cause of its poor quality. What is lacking in the butter-maker is not the knowledge of some profound and mysterious secret that is known only to a few experts, but rather the every day common sense necessity of keeping milk clean.

If a butter-maker is on a farm or in a private dairy where he has control of everything from the cow to the consumer, there is no excuse except ignorance or carelessness, for the defects that may appear in his butter. Such a butter maker might say, however, that his ignorance renders him guiltless But ignorance of the law does not avail in the criminal court, and why should it be accepted as an excuse for poor butter? The man who makes inferior butter should be sentenced to attending every session of the dairymen's meetings, and compelled also so read a dairy paper regularly. If this does not have the desired effect, then send him to a dairy school for at least three months at hard labor.

If this sentence is too severe and the judge is disposed to give the victim of ignorance some good advice, his first charge would be in regard to protecting the natural purity of milk.

A butter-maker who is hungering and thirsting for information must always keep in mind the elementary principles of the business. The milk, cream, and butter must be protected throughout all the processes of their manufacture so that they may arrive at at the Queen's table in as pure a condition as a healthy cow can produce the milk from sound feed.

Milk ought not to be made from musty or decayed feed, or to be contaminated with any solid, liquid, or gas after it leaves the cow. Pure milk must be kept clean. This fundamental dairy principle is the secret of the dairy success. It has been preached over and over again, and the bacteriological reasons for it have been studied until we have obtained a scientific demonstration of the necessity for having absolutely pure milk.

If a gardener had it within his power to obtain weedless soil, we cannot imagine him doing anything else than making every effort possible to protect this soil from contaminating weeds. It would seem much more sensible for him to try to do this than to defer his labors until the weeds began to grow.

Although this ideal condition of the soil may never be anything but a dream with the gardener, the dairyman's opportunity for getting free milk can be realized. Success in butter-making depends largely on a persons ability to protect the natural purity of the milk from the weed like bacteria that lie in wait for it.

Investigations have shown that healthy cows produce germ-free milk, and when a butter-maker understands this fact and realizes the advantage it is to him, he has made some progress. He has learned a great deal. The men that milk the cows must now shoulder the responsibility of some of the defects in dairy products which were formerly laid to the scape-goat cow. This is well understood by some men, and the milk producer, the milk dealer and the manufacturers ought to keep themselves informed in regard to what is known about milk. If they did they would undoubtedly find that some things which they once considered as unknown are now very satisfactorily explained. Enough new information is brought to light every year to make it profitable to keep posted.

One of the discouraging things in the dairy business is to see what little interest some men take in their own welfare. A Wisconsin creamery owner once distributed among his patrons 500 copies of one of the best dairy papers published, and he only got five subscribers out of the 500.

Ninety-nine per cent. of these milk producers apparently did not feel the need of knowing any more than they already knew about dairying. This is a good illustration of the truth there is in the statement that "The farmer's mind as well as his acres needs to be seriously considered by investigators." I think this is something that creamery butter-makers will do well to study over. Try to think of ways by which the men who milk the cows can be helped.

Some things that you know about milk may be entirely unknown to them, and if you can induce them to produce more and purer milk you are helping them as well as yourself.

An enthusiastic young creamery operator once said that, "It will be a good time for butter-makers when every one of the patrons keep everything, barn, cows, milker, milk pail and milk can clean, when the milk cans are kept uncovered where no bad odors can get into the milk and when farmers go into dairying by selecting cows for the purpose. This" he said, "can be written in a few words, but it has proved hard to learn."

This practical man realized that it was not entirely the unknown about butter making that is responsible for any faults in his butter, but that the defects are caused by the failure to do something that is already well known he ought to do.

Some of the little things like airing the milk and scalding the cans are so important that failure to do them will often prove fatal to the fancy quality of butter.

We do not need to study up new methods or make new discoveries to show why and how milk ought to be cared for; there is enough already known about the kind of care that milk needs. What we do want, is to have every one apply the knowledge we already have about the subject. Butter-makers must expect to be teachers, and the most successful ones will be the best teachers.

Some creameries always make good butter and others never do, but the operator of the latter factory does not know the reason for his failures. The successful operator could probably tell him and as the knowledge he has is not beyond any average man's comprehension, it is the unsuccessful man's own fault if he does not find out where the trouble lies.

A butter-maker was quoted in one of the dairy papers as saying that he was advised to lay science aside and use a little horse sense, and he said he found this was good advice, but he further stated with great emphasis that the most essential thing about the business was to keep everything clean.

It has been stated in Chicago Dairy Produce, that only 25 per cent. of the butter made in the United States is of extra quality which brings the top market price, and a contributor to that paper also shows from a record of about two days receipts of butter held in the cellars of sixteen Chicago commission merchants, that the losses on this butter on account of the inferior quality of some of it amounted to over $16,000. In other words, if all this butter had been of a quality that would receive the top market price it would be worth sixteen thousand dollars more than it actually was worth. The figures on which this statement was based were the following:

Grade of Butter.	No. of Packages.	March Quotations.	Loss per Pound.	Total Loss.
Firsts	665	17½	½c	$199 50
Seconds	495	14½	3½c	1,039 50
Thirds	632	11	7 c	2,554 40
June	380	10	8 c	1,596 00
Dairies	1,300	10	8 c	3,120 00
Imitations	450	15	3 c	405 00
Ladles	1,635	7	11 c	5,395 50
Roll	165	7	11 c	1,815 00
Packing stock	192	6	12 c	691 20
Total loss				$16,816 30

Taken from Chicago Produce, Vol. 1, No. 42, page 10.

At the time of this record only seven per cent. of the total stock of butter on hand was of extra quality. This is a startling statement, and I hope is not often true that the best butter is so scarce, but it goes to show what an enormous loss there is from poor butter. Some of it is doubtless due to excusable circumstances such as remoteness from market and age of butter, but a large part of this loss comes from someone failing to put into practice what is already known to be essential for making the best butter.

It seems from this to be plain that in order to bring this enormous amount of inferior butter up to the standard of the best there is a wide field of labor for teaching what is already known about butter making. Such instruction will be needed for a long time to come, and the fact that some butter of extra quality is always being made shows that some one knows how to make it. The methods employed are not secret, neither are they complicated, and it is very encouraging to know that there is a constantly increasing number of men and women who can give the latest and best information on this subject.

There are some problems in milk and in butter making however, about which a great deal seems to be unknown. The secretion of milk is not thoroughly understood by the most profound scientist. Up to about 1840 it was generally taught that milk was secreted or merely filtered from the blood through the milk glands. At the present time this theory is not accepted, as it has been shown that there is no casein in the blood, and in fact the milk sugar, ash and butter fat are not the same in both the blood and the milk. Another thing that puzzles us all is the influence which feeding has on milk. It it were

true that milk is merely filtered from the blood, there would not be any difficulty in changing its richness by changes in feed, but it is a well established fact that the quality of cow's milk is a natural characteristic, something that is born with her, like the color of her hair, and all careful experiments show that so long as you give a cow sufficient nutriment, changes in feed will not perceptibly influence either one of these peculiarities. The effects of some feeds, however, can be plainly noticed in the butter fat of milk; "full grass" butter is decidedly different in flavor and in texture from that which the same cows manufacture from hay and grain. It is also a well recognized fact that cottonseed meal when fed to cows will influence the hardness of their butter, and clover hay can be depended on to increase its yellow color, but I doubt if any one knows why it is that the color of the butter fat from different cows will vary so much as it does even when they all receive the same feed.

No satisfactory explanation of this fact is known, and the same might be said of many other things in regard to butter making, but the little that is known needs to be taught in all the different ways imaginable so as to reduce the enormous loss which the producers of poor butter have to suffer.

A MEMBER: I would like the Professor's idea as to how we can get these things into the minds of the farmers. It seems the most difficult thing in the world to get men to listen to anything in reference to the making of butter.

Prof. FARRINGTON: I think, perhaps, that is a question which each locality will have to answer for itself. I tried to impress it on our dairy students to keep themselves loaded well so that, when they meet the farmers at their factories, they can be a walking encyclopedia, and distribute their information to the farmers. I think any man who operates either a creamery or a cheese factory can do much good in that way. A short time ago a minister in the town where I live gave the results of an investigation in regard to the saloon people of Chicago. It was supposed to be a scientific investigation. They went to work to investigate the damages that come to humanity from the saloon, and they found in giving the results of this investigation that the saloon-keeper was the best posted man in the community, and that everybody liked to go in there and see him. The saloon was the poor man's club. The saloon-keeper was posted on the latest news in every particular, and I have told our students, as they come to factories, they want to be as well posted a man as any saloon-keeper, and that the patrons ought to be as anxious to see them as the patrons of the saloon do the saloon-keeper. Of course that may be a bad comparison, but the idea of the creamery or cheese factory operator being a man who is posted with regard to the new things that come out in the dairy line and is able and willing to give it to the farmers, is one of the best ways in which you can spread this information, and get them interested in their work. (Applause.)

Mr. DICKSON: I came here to learn and not to give my evidence, as I am not well enough posted in expressing an opinion to any one here. I am interested in seeing the quality of our butter improved. I want to see it take the first place in the world, for I believe we can make it the best butter in the world if we only get the proper product from the farmers.

A MEMBER: As our friend has just stated, we have come here for information, as our last speaker has stated the subject of his address was the "Known and Unknown about Butter-making." Now we butter-makers in this gathering want to find out a good many things which we do not know. Now, as far as the discussion has gone, the biggest fault is, I see, laid upon the farmers not taking into consideration perhaps the faults of the butter-maker. The question I would like to ask is, after we have received from the farmer the milk, what is the best process to get the best results from that milk which we have received? Outline the process which you would adopt.

Prof. FARRINGTON: My name is three times on the programme. I believe the last time it says "Discussion on Butter-making," and I presume the topic which this gentleman has mentioned will be brought up at that time. You can write a book on butter-making. If you took up the whole subject of butter-making it would take the time of two or three professors in writing the book. I don't know where you would stop if you started in on that subject. If there are any particular parts about the process that you want to take up and discuss, I should be glad to help the discussion along; but as to talking on the subject in general, I am afraid it would take too much time. There are other speakers besides myself.

THE BACTERIAL CONTENTS OF CHEESE AND THE CURING PROCESS IN CURING ROOMS.

By Dr. W. T. Connell, Kingston.

This address will be found in the Report of the Eastern Association. (See page 30).

Prof. Dean: Dr. Connell mentioned several theories concerning the curing of cheese. I would like to ask him whether he considers rennet has any influence on curing cheese.

Dr. Connell: I cannot answer that question accurately. I do know when we had more rennet the cheese seemed to cure more rapidly. I do not think anyone can answer that question yet.

Prof. Dean: When we use a larger quantity of rennet we find the cheese cures more rapidly. I know the bacteriologists generally say rennet has no effect on curing cheese.

Mr. Sleightholm: In Dr. Connell's judgment, what in a general way would be the cost of putting an ordinary curing-room in proper condition and putting in ice-boxes to control the temperature?

Dr. Connell: I cannot answer that question. I expected Prof. Robertson here who has full details of these matters, and I did not pay any attention to that point at all. I was to examine the bacteriological contents of cheese, and cannot give any idea of the cost.

Mr. Sleightholm: One point brought out as to the control of temperature was the putting of a commercial value of three-quarters of a cent per pound on to the value of cheese where the temperature was controlled. Supposing you said one-half cent per pound. I think even one-quarter of a cent per pound on a season's make of cheese would amount to such a sum that the factory-men would certainly put every factory in proper condition.

Prof. Dean: We have figured out about what it would cost to insulate the ordinary curing-room in good condition. I think from $100 to $125 would do the work in most cases. As for the ice-boxes, Mr. Bothwell and Mr. Bell should be able to tell you. I should say from $5 to $6 apiece would be the cost of an ice-box, and a sub-earth duct may be put in for $60 to $100. That would be additional of course to the lining of the room.

A Member: The doctor has shown us to-day that the ripening bacteria are the lactic acid bacteria, and probably if you would give us the temperature and the condition of moisture under which these bacteria thrive best, it would help very much to solve the question, which is a very important one to the cheese industry of this country, and very important to every cheese-maker. It would solve the question that they have to contend with in developing most rapidly the acid-producing bacteria, the lactic acid bacteria, or the lactic acid ferment, and altogether he does not go into the mechanical part of it, at the same time the conditions under which these bacteria are developed most rapidly would help to solve the question.

Dr. Connell: In taking up the question of the best development of the lactic acid bacteria, we have also to take into consideration the fact that in cheese we do find other forms of bacteria, and while in good cheese these are practically insignificant, we must always remember that we will find a certain number of cheese not of this character. We find a temperature of between 55 and 65 very favorable; from that up it is favorable for the development of lactic acid bacteria. As we come higher the lactic acid bacteria flourish well. These higher degrees produce forms of taints and gases, consequently cheese kept at this temperature, 55 to 65, cures better. The higher temperature might develop taint forms, and that may be an important point in the factor of cheese-curing. I have only done one season's examination. In the cheese I examined none of these forms were present, and I didn't have to contend with them, but if we raise the temperature above 65 it becomes more favorable for the development of certain taint forms, consequently I think the lower temperature would be more suitable for the development of lactic acid germs.

A Member: The higher we develop the bacteria, the flavor is not so good. A temperature of 80 would develop rank flavors, the lower temperature developes a better flavor.

Mr. Ballantyne: How would you suggest keeping out this bacteria that produces bad flavor?

Dr. Connell: Their sources are generally in the process of milking. We would have to take thorough care to keep the milk clean and away from dust. That is the chief source of taints in the milk, keeping the milk in dusty places.

Mr. Ballantyne: They usually come from some kind of putrefacation.

Dr. Connell: Yes. The most common source has been dust, particles of manure, in and about the stable, and hairs and the like falling from the animals. All these usually show marks of bacteria, some good, some bad. In manure particles we have a large number of very small forms which produce stink—stink producing forms, and gas, producing forms.

A Member: Can the doctor tell us what make the milk become bitter?

Dr. Connell: I think bitterness develops in milk kept at a fairly low temperature at 50 and 55. In the samples of bitter milk, I have found that it is due to the development of the acid forms. It is a bacteria form and low temperature favors its growth.

Mr. Ballantyne: Would it be possible for the taint form of bacteria to get in after the curd is made—after you have the milk into curd?

Dr. Connell: I think it certainly would. I can speak with experience of one form, which perhaps is not a real taint. In 1896 I examined some cheese which was made in a factory which showed rust discoloration, from the size of a pin point up to a split pea. These rust spots were due to a growth in the cheese. They did not appear in the cheese until after five or six days, and they were due to the development in that cheese of bacteria, which got into it from the dry dust on the edges of the gutter leading out from the factory. This cheese was affected during the process of manufacture. This was an instance of where we had the curd tainted. That might have got into the milk, but we found it present in the cheese made on a certain day, and not present in the milk, consequently we said it must have got in at the factory. As we had the growth there in the gutters, we thought it was evidence as good as we possibly could bring forward, to prove our statement.

THE INSECT ENEMIES OF FODDER PLANTS.

Dr. James Fletcher, Dominion Entomologist, Ottawa.

The subject I have chosen to speak on this afternoon, is one which all of you ought to know about, and probably do know about, but I find that a good many fodder-growers of Canada do not know quite as much as they ought to know for their own good about the different insects which attack the crops from which they get their milk, cheese and butter, gilt-edge products which bring in so much money to the country. During the past year, fodder crops in various parts of Canada have been of a very spotted nature. Crops of hay and fodder have been very excellent in some districts and poor and short in others. In some parts of Western Ontario there has been a shortage in some of our summer crops and early autumn crops.

Most people know that there is no grass or fodder crop in Canada, which can compare with the quality and quantity that you can get from an acre of Indian corn; yet, on account of the failure of this in some parts, some people have considered it advisable to give up growing that crop. Wherever you can grow corn I would never advise you to give it up. It will give you more good feed to the acre than any crop you can grow, and where you develop your dairy industry in the way you have in western Ontario, you must not give up growing Indian corn. As a rule, shortage in Indian corn, is due to a lack of proper agricultural methods and proper farming, because Indian corn, being a tropical plant, is certainly better suited to stand drouth than almost any other crop we can grow, and as to those who have failed, the failure is greatly due to not using the cultivators often enough. The use of the cultivator is now so well known, that almost every farmer knows that its use will enable the land to hold moisture better than anything else you can do. In the North west Territories and Manitoba, this has been recognized to an extent that every farmer summer-fallows his land more frequently than

he used to do. Summer-fallowing in the west is not summer-fallowing in Ontario. It is done here with a different idea to that adopted in the west. Summer-fallowing in the west is almost entirely a method to hold moisture in the soil. Around Indian Head, Moose Jaw and Regina, where farmers gave up their farms some years ago because they said it was too dry, the land is selling now at a higher figure than in other part of the North-west Territories, because the farmers have learned and are practising improved methods of summer-fallowing, which means the plowing either deep or shallow and harrowing very quickly afterwards. Another method which has been adoped during the last year or two is to use a light harrow or weeder on their grain crops, not only for the purpose of destroying the weeds, but because it acts as cultivation on the growing crop. Throughout the west a few years ago, there was here and there an odd man who had a weeder. There were no less than four carloads went in one week last year, so you see the use of the weeder must have been adopted in the west with good effect. Where the country is given up year after year to the growing of wheat, it must be expected that those weeds which live on the land with the wheat, and ripen their seeds before that crop, must keep on increasing, and that has been the case.

There are many fields in Manitoba where nothing but wheat has been grown for twenty years, and these fields have gradually become weedier and more weedy. The new method which they have adopted is the use of light harrowing till the grain is from four to six inches high, with no injury to the wheat, and they get very good results. They break up the thin film on the surface, and make a dry blanket which holds the moisture in the land. Indian corn is going to be the backbone in this part for cattle feed for many years. There are some substitutes, such as growing green feed, peas, oats barley grown together—a bushel of each to the acre. These are early crops, and the only reason they have succeeded better than corn is that you can get them in very much earlier. You put them in nearly a month earlier than you do corn, and consequently they get advantage of the winter rains. They are often done with before the corn feed comes in, but do not suppose these will ever take the place of Indian corn, which, as I said before, is one of the most important fodder crops we have to do with. Indian corn is not attacked by very many insects; cut-worms, of course, are serious early in the spring. It is well for every farmer to know something about cut-worms, as every year they destroy so much. Cut-worms are of three different kinds, so when a man says: "I want a remedy for cut-worm," he must give more information about it. There are different kinds of them, varying a good deal in their history, and in the way they do their work. There is one general principle with regard to all these cut-worms which every farmer should remember. If he leaves his land dirty in the autumn he may be sure he is going to have cut-worms next year. A great number of these different kinds of cut-worms are caterpillars hatched from eggs laid by this moth. These moths come out in the autumn and lay their eggs upon plants. They are not particular as to the kind of plant they lay eggs on. Most of these that feed on Indian corn are caterpillars of insects which fed upon different kinds of grasses. If we leave our corn field, or any other field, in a dirty condition in the autumn, we may expect that these moths will fly to the plants and lay their eggs on them. Caterpillars pass their time in the winter in two ways, either as eggs which don't hatch till the spring, or as caterpillars which pass the winter in a torpid state ready to go forth early in the spring and attack any green plant which comes up. Therefore, it is important to know that our fields should be kept clean in the autumn, because those moths will lay eggs wherever there is a thick growth of weeds or any other plant. They will not lay their eggs where there is no plant, because there would not be any food for the young caterpillars. Clearing up the weeds in the autumn is not so much to make your farm look pretty as it is to save money from your own pockets, which you will certainly lose next year if you leave your farm dirty. Why is it that Indian corn is more frequently destroyed on grass sod than it is where you plow down clover? Because as a rule these insects which feed on clover do not feed upon different kinds of grass, and sometimes you sow your corn on a meadow plowed down and sometimes on clover sod. You will notice that the plants sow on clover are cleaner from attacks of cut-worms than those where you have plowed down meadows, that is because these insects which feed on clover do not always feed upon grass. There are some which do. You will always expect some cut-worms where you grow corn. If you find you have a bad attack of cut-worms you can do something, but it will cost you labor and money. If

a farmer has any reason to suspect cut-worms he can, before the corn appears above the land, make an application that will destroy them. Where cut-worms are abundant put bundles of grass around the fields.

A successful experiment was carried out by taking a cart-load of this green material and pitchforking it on the field of corn that was green, and that part of the field was perfectly free and made a good crop, whereas, in the other part of it, it had to be resown. Another method where corn is grown in drills is by making a mixture of bran and Paris green—a pound of Paris green to every twenty pounds of bran—and then distribute that across your field with your seeder, the wheel-hoe or small Planet junior seeder. Run it over the field and along the drills. Many fields of turnips were saved in this way by making a mixture of bran and Paris green.

Cut-worms vary very much in their nature. You may find it necessary to have definite information with regard to some certain attacks, but, if the fields are kept clean in the autumn, they will be freer from attack than those left dirty. If caterpillars are present in large numbers the sooner you attack them the better. It does not pay as a rule to let your crops take chances and trust to Providence, because Providence expects us to help ourselves a little.

During the last summer a new insect appeared in Canada, and did a great deal of harm. The pea crop as a rule has generally been free. Among insect pests, the old pea weevil and the pea worm and the lots of other enemies we should not have. The pea weevil is much worse a pest in Canada to-day than the farmers in Canada ought to allow it to be. The farmers in Canada are responsible for the loss which takes place from the pea weevil. Seedsmen systematically fumigate the seed and so get rid of the weevil, but farmers throughout the country are saving their own seed, and as truly as seedsmen are treating seed and killing the weevils the farmers are not doing so, and there is no reason why they should not. The matter is extremely easy. If every farmer in the country would treat his seed before it is sown there would be a very decided decrease in the number of these insects. The destruction during the past season was enormous, yet many farmers have given up treating their own peas because they take it as a hopeless case, so they sow their peas and are glad for whatever crop they may get. We have found that a sure remedy to get rid of the weevils is to take a coal oil barrel and put five bushels of seed into it. Whether that seed is infested with the pea weevil or not, if you are living in a district where that insect appears, it will pay you every year to treat your seed. After you have put the peas in a barrel place on top of them a soup plate. In that put three ounces of bi-sulphite of carbon. Take a couple of sacks, dip them in water and place them over the top of the barrel, then cover it with some boards, leave it for 48 hours, and the peas will be ready after that time to sow and they will be perfectly dry. The liquid evaporates and becomes a gas heavier than air, which falls down through the seed and destroys every insect in them, and then you have only to contend with the insects that may fly from your neighbors. In Prince Edward County when they were shipping peas in barges, after the barges were filled there were several inches of insects on top of the peas, they had become such a pest in that district.

Ten years ago we had not a spraying pump to each county in Ontario. I do not suppose there were 100 pumps in Ontario while now there are 100,000, and every man who grows fruit knows he must treat his trees. He knows that for every ten cents he puts on in spraying his trees he receives from three to four dollars more money in fruit; consequently the fruit growers have wakened up a little sooner and they are doing more in that way than the ordinary farmers are doing in fighting the small insect pests. The pea aphis that appeared this year on the pea has been destructive. I received a great number of letters from farmers asking what this new thing was. Here is the pea aphis, the same as the one was on the apple trees. It has wiped out whole crops, field after field being utterly destroyed. Not only did it grow in Canada, but right down to Maryland in the Southern States. In the State of Maryland it destroyed three million dollars worth of peas, and no one knew anything about it. It is not an insect that can be easily treated. The tent caterpillar also did a lot of damage last year. In the Province of Quebec where sugar was one of the best crops there will be very little crop next spring, because the leaves have been eaten out of the trees, the stomachs of the trees have been eaten out, and they have been so injured that there will be a reat loss in the crop next year. We cannot do much to an insect that attacks a crop such as a forest or a wheat field unless

we know something about it before hand. This was an entirely new insect. No one had ever studied it before. It had never been abundant enough to draw attention to it, but wherever it occurred in pea fields it swept them out. First, we considered the fact that it had never appeared before, and therefore we might hope it was not likely to appear again; but it was necessary to have something to substantiate that fact. We then found that its enemies develop in very large numbers, and therefore it is plain it will not occur in the very large numbers it did this year. On wheat and oats, particularly some years, we have an occurrence of green plant louse. This very seldom occurs two years in succession because it is wiped out by its enemies, and we hope next year the pea aphis will not be abundant as it was this, but I would advise you not to put in so many peas this year as you have formerly, though I would not withdraw peas altogether, because they are of such value to your soil. They belong to the same family as clover and very much increase the value of the soil by the nitrogen which they collect. Another method of getting rid of the pea weevil is to keep your seed over a year. Put the seed in paper bags, and hang them up so that the mice and rats cannot get at them. The weevil cannot gnaw through the paper bags and they will be dead before the second year. Peas that are required for the table should be sown as early as possible. Sow only the earliest varieties. Every one knows you can sow peas directly the frost is gone from the top inch of the soil, and that peas will stand more cold at their feet than almost any crop you can sow. If you sow your early varieties you get your peas ready before the first of July, and that gets rid of this insect.

The next insect which does most harm to crops, is the army-worm. It occurred in almost every county in Ontario last year. These caterpillars appear in large numbers and sweep the whole country. They are not generally noticed until some time in July and then all of a sudden, they appear in very large numbers and sweep through the timothy fields, and very often through oat fields, and do a great deal of harm. They do not attack clover, and when timothy and clover are grown together the clover is left alone. The army-worm does not give us much warning when coming. It does not spread from its natural haunts except in damp seasons. It lives in swampy ground. But when we get a wet season, these caterpillars come from their own crops, and go forth and attack the crops of the farmers, and it has been found that they will attack crops more than they will the wild grasses. Even in the West, where the locust is a native insect, it attacks the crops in preference to native grasses. The farmer has every year to fight against insect enemies. If it is known exactly what to do, most men will do it. With regard to the army-worm, there are many means by which they can be prevented from coming on the land. They are generally so numerous, that they attract a great deal of attention for they sweep everything before them. I have seen a timothy field that looked very well on Friday evening, and on Tuesday of next week there was nothing but bare stems showing in the field. They went on from that field and got into an oat field next to it. They were entirely stopped by plowing three furrows down the middle of the oat field, throwing the soil away from the direction they were coming from, and leaving an upright edge that they could not climb over, so that when they ate up to this part of the field, they soon filled the furrow up, and finding this edge against them, they began to wander along this furrow. They were prevented from passing that by digging pits every twelve feet along the furrows and these they filled in the very short space of a single day. They were then killed by throwing coal oil upon them and were shovelled out. An insect which occurred four years ago last autumn, and appeared in some numbers, is called the black army-worm. It is black with white stripes down the back. This can be treated exactly in the same way as the true army-worm. It very seldom occurs in such large numbers. Instead of feeding chiefly on the grass crops, it attacks many kinds of bushes. In places where it is destructive, it must be poisoned with the bran mixture or the poisoned weed traps. Clover is a good thing to use against this, because it lives on clover. In years of great abundance it spreads from the clover fields and appears in the gardens. It is velvety black with fine white spots along the sides. Where cabbages or tomatoes are used, a piece of paper wrapped around the plant will prevent it. Do not roll the paper around the plant tightly, but simply wrap it around the plant.

Many farmers feed off their first crop of clover before the third week in June. If hey do this they reduce the occurrence of the clover seed midge in the second crop, and, where that is done, second crops of seeds are secured. You can either turn your cattle

in on your fields so that they eat the clover down, or you can cut the clover and feed it to the stock. There is enough seed in the first crop for this insect to feed upon, and for it to destroy the second crop of clover seed. If the method be adopted of cutting the first crop before the third week in June you destroy the insect, but if you allow it to stand until the first of July you allow the insect to grow.

Grass-hoppers have done a good deal of harm during the last year or two, not so bad during the past season in Ontario, but every year grass hoppers do a certain amount of injury. In hot, dry seasons they are worse than in the wet seasons. The reason of this is, that they are to a large extent killed off in dull wet weather when they are young. The eggs are laid in the autumn and do not hatch until the following spring. When the young grass hoppers are hatched they are less than a quarter of an inch in length and very delicate, and if there is wet weather at that time, many of them are killed off. Of course, when they become very numerous they produce parasite insects, and one of the most abundant of them, is the grey or black blister beetle which sometimes attacks potatoes. A farmer finds this on his potatoes some fine morning, and does not know where it came from. If they are not attended to at once by poisoning the plants, they will do more harm than the old Colorado potato beetle. They come out of the ground fully formed. Up to that time they were good creatures, and were doing us good, but when they take on their black coat they put on bad manners. Before that they were feeding on grass-hoppers' eggs. There is no insect which brings down the number of grass-hoppers more than the blister beetles do.

There is a little red mite, a bright scarlet spider. This is a parasite of the grass-hopper. It is not a true spider. It is a mite, and it lives entirely on the eggs of the grass-hopper.

Another curious parasite is the hair worm. It just looks like a horse hair. Boys will tell you that if you throw a horse hair in the water, it will come to life and turn into a worm. It is a worm that lives inside of other animals. Its eggs are laid in the water. The mites swim about in the water and attach themselves to some of the water insects, chiefly May flies, that are so abundant, and chad flies. They penetrate right inside their bodies through some joints in the legs, and they live inside these insects until these are eaten by fishes. Where they are not eaten by fishes the parasites die inside them. All those that are eaten by fishes live inside the fish for a certain time, and then leave the fish and crawl ashore, and attack grass-hoppers. In the last grass-hopper year you could hardly catch one of the large grass-hoppers that had not one or two of these worms coiled up inside its body. We find that with the parasitical insects where there is a great number of them one year, there will not be so many of them the next, and afterwards will pass away altogether. You may say, if that is the case, why should we do anything? The answer is, because we live in an artificial manner. Nature has its own ways of doing everything, and they are sure to be slow. It does not do things quickly. We know that we have an average of forty or fifty years in which to live, and that all we are going to be, is going to be in these years, and so we want to know the quickest method of getting returns for our labor. The farmer has to learn the best thing to do under certain circumstances, and therefore he seeks to destroy these insects and parasites as rapidly and as quickly as possible. (Applause.)

BENEFITS OF SOILING COWS IN SUMMER.

By W. C. Shearer, Bright.

I am going to speak to-night on the soiling of dairy cows in summer, from the standpoint of a cheese factory patron. We all know the benefit that we derive from having a full supply of milk. To obtain this you must have a good herd, and then abundance of proper food to get milk. I will give you an instance of two patrons. One has an A1 herd which he soils, and the other has an indifferent herd, to which he pays no attention. Now you know that, in the spring, cows do their best without any extra food, as long as they are supplied with an abundance of good, clear, pure water, but that after the spring grass is gone, you must have something to keep up the flow of milk. In preparing for soiling, manure the land well, then work it up in good shape and sow about a bushel of peas to a bag of oats, mixed. If you have too many peas, it will pull down

your crop. As early as you can, get half an acre ready, and sow it at the rate of two and three-quarters to three bushels per acre. Sow it thick, because it takes the same work and labor to produce five tons per acre as two tons per acre. Sow this before the 1st of May. In 10 or 12 days sow another half acre of the same, and 10 or 12 days later, another half acre If it is a good showery season, you may not need to use anything until it is ripe, which will be about the first week in July. Top-dress an acre or two of your clover land with a light coating of manure in the spring, and have that prepared in case you need it. Feed the clover first if it is required. As early as you can get in a couple of acres of corn, put it in drills or hills I prefer it in drills. We put in about two acres and keep that well cultivated. It will be ready for use by the 1st to the 15th of August. There is one benefit of these oats and peas mixed. Whatever you do not require you can keep for hay. If you have only used part of the first half acre keep using it when the next is ready, and keep the balance for next winter's food. I do not like the idea of hauling out feed to the field to feed the stock, for the reason that cattle getting food outside, whenever they see you out with the team, run to you thinking they are going to get some feed. It is best to feed them in the stable. In the fall if it comes very dry, we scatter a little cornstalks once or twice a day in the pasture field, but it is better to give them the main bulk of their feed in the stable. By feeding in this way you keep your cows up to the full flow of milk which is the great secret of making money out of cows. If you let them run down to one-half it will take as much money to bring them up again as it is worth. There are a great many dairymen who have a pair of these light spring balances, and every cow's milk is weighed once or twice a day in order that they can detect immediately if a cow is going down. If you keep track of your cows you will find some that do not pay at all and others are two or three times as good, and that the poor ones are eating the heads off the good ones. Another great benefit of this soiling system is that you clean the land. The soiling crop is all cut before the weeds are ripe and is off in time for you to put in the fall wheat if you want to, or it will be in good shape for next season. Now then, I will give you an instance of two dairymen in my neighborhood, One is about the best, and the other is not the worst, but amongst the poorest. They have each one hundred acres. Last season was very dry, the dryest I have ever come through. We had not a good soaking rain from the time the snow went off till October. This good dairyman had fourteen cows to which he attended thoroughly. He had about an acre of oats and peas and put in two and one-half acres of corn early, and he fed his cows right through the season. Both these farmers sent to the factory for seven months and the good dairyman received in the seven months an average of 6,007 pounds from each of the fourteen cows in the herd. The other dairyman who did not provide anything received an average of 2032 pounds each. Then when it came to money, the man with the 6007 pounds got $49 per cow, the other man got $18 per cow. The poor dairyman's cows averaged $2.59 per month and the other man $7.00 per month. Now the fault was at home. One man prepared against the drouth in case he need it, and the other man prepared nothing. He hoped it would be a wet year and that there would be plenty of grass, but if it was a dry year he expected to have no money. He received about $162 for these nine cows and the other man received $441, making a difference of $280 to the man for his farsightedness. The good dairyman's cows were all purchased at sales except four. Two had part Holstein in them, two had Ayrshire, and the balance were part Shorthorns. I looked through his cows and found they were all of a splendid dairy stamp of a cow. Some men think the breed is the whole thing, but it is not. In all breeds there are splendid good dairy cows. This man told me he considered himself a pretty expert judge of a cow. I said to him, "You would not buy a $25 cow if that was all she was worth," and he said "No, I always like to pay $40 and $45 and $50, and I like to buy a cow pretty young for fear the other fellow spoils her before I get her." Some cows are made by the dairymen who break them in, and other cows are spoiled by the same men. He told me he found some cows when he first bought them that could only consume and digest so much feed. After he had them a few years they could consume a half more, and it all went into the milk where he wanted it. Now if we could only get the patrons of cheese factories to believe there was that much in their cows it would be a great benefit. If some of the cows owned by patrons belonged to me I would make a sale of them, and if I could not do any better, I would hire in cows at a dollar a month.

FARM TESTS OF COWS.

By Professor Farrington, Madison, Wis.

At the present time there is not much necessity for urging creameries to use the Babcock test. Within the past five years it has become almost universally adopted as a just and satisfactory means of determining the value of all milk delivered to both creameries and cheese factories, and creamery patrons can no longer sell milk to the factory by weight only, neither can the factory buy it in this way. It is very generally agreed that milk ought not to be bought simply by the pound any more than a cow or a horse. We would all think it absurd to see or hear the statement, that horses were quoted in the market at a certain price per pound, but such a statement is not much further behind the times than the practice of buying and selling milk by weight without testing it.

Since the practice of testing all milk at butter and cheese factories has become so well established, the justness of the plan has led many farmers to apply the same test to their cows. This, it seems to me, is the direction in which the use of the test should be pushed at the present time. Every farm that supports cows for the purpose of selling milk, ought to be provided with a pair of scales and a Babcock test. By weighing and testing the milk of each cow a sufficient number of times, the owner can keep himself informed of the actual performance of each cow. Records of this kind show the relative value of the cows as milk producers, and aid in determining the actual profit or loss which should be charged to each cow annually.

The farmer who wishes to keep cows that will support him, and does not intend to work for the purpose of supporting his cows, needs to understand that:

First—If 150 pounds of butter only pays for the yearly feed and care of a cow, then one producing only this amount, or less, is not paying a profit.

Second—One cow is often worth twice as much as another, or more than two cows, although there may not be a very marked difference between the total annual production of two cows. This may be illustrated by comparing the record of a cow that produces 152 pounds of butter with one producing 151 pounds. The former yields twice as much profit at the latter, provided 150 pounds represents the amount necessary to pay for feed and care; and a 250 pound cow makes twice as much above expenses as one with an annual production of 200 pounds of butter.

This is a side to the dairy cow question that a good business man will consider carefully. There are some dairymen who have become convinced that the time and money spent in weighing and testing the milk of each one of their cows is a profitable investment for them, and they could not now be persuaded to abandon the practice of keeping records of the quality and quantity of each cow's milk. There are others, however, that have not yet reached this stage of development, and it was with the hope of reaching them that the writer undertook the testing of some forty cows on six different farms. The owners of these cows had been sending milk to the Wisconsin Dairy School Creamery for several years. None of them had a Babcock tester, and some did not have a suitable pair of scales for weighing the milk of each cow at milking time. By paying each one of these farmers one dollar per cow tested, I was able to induce them to weigh and sample the milk of each cow they owned for one day per week during an entire year.

The tests made on the different farms were all conducted on the same general plan. The milk of each cow was weighed and sampled at the morning and night milking one day in each week. The testing day was selected by the patron. Each dairy was supplied with a pair of scales for weighing the milk of each cow at milking time, a box of bottles for milk samples, a small one ounce tin sampling dipper and a record book. Each cow was given a number, which was also placed on the label of a two-ounce sample bottle, the cow being known by this number throughout the test. About one-half gram of potassium bichromate was added to each sample bottle to keep the milk sweet until tested. The box of samples and the record book containing the weights of both the morning and night milk of each cow were sent every week to the University creamery, where the samples were tested; the tests were recorded in the patron's book as well as in the permanent record at the creamery, after which the book and box of sample bottles were returned to the farm. This weekly sampling, testing and weighing was continued throughout the year. The records thus obtained furnish data for determining the value of the milk produced by the different cows.

The accuracy of such records as these is necessarily influenced by conditions common to nearly all farms. Milking is usually done with more or less haste, especially at the planting, haying or harvesting seasons. The milkers, as a rule, are not accustomed to the use of scales and often consider a weight within one pound of the true figures to be "near enough." They do not understand the necessity of promptness in sampling milk after it has been poured from one pail to another before the cream has begun to separate. In spite of these and other disturbing factors, our results show that tests of dairy cows can be made by the farmers themselves with sufficient accuracy to give a very satisfactory knowledge of the performance of each cow.

As these same farmers sent their milk to the creamery daily, the creamery weights and tests of the milk can be compared with the farm figures on testing days. Although this is a comparison of one weight at the creamery with the sum of twelve to twenty-four weights taken at the farm, according to the number of cows in the heard, the figures in the following table give the results of a one-day trial made at four of the farms, and show how close an agreement was obtained.

Comparison of farm and creamery weights and tests at four farms :

MILK OF ONE DAY.

Farm.	No. of Cows.	Farm lbs.	Creamery. lbs.	Difference.	Farm Test.	Creamery Test.	Difference.
A	8	130	115	15	4.56	4.5	.03
C	11	231	211	20	4.3	4.3	
D	6	118	113	5	3.8	4.0	.2
E	4	79	73	6	4.5	4.4	.1

It is to be expected that the farm weight would be greater than the creamery weight on any given day, because a certain amount of milk is always kept at home for family use, and even if that is not the case small errors in making twelve to twenty-four weights are unavoidable in handling the milk at the farm.

The total annual production of a cow was found by multiplying the average of the four or five daily weights of milk and of butter-fat taken each month by the number of days in the month, and adding the products together.

The money value of the milk of each cow was found by multiplying the monthly weight of butter-fat by a certain figure, which was one half cent less than the average Elgin market price of butter for that month, and adding the products together.

Feed and Care of the Herd.

The cows at each farm were fed and cared for during the entire year according to the usual practice of their owners. As far as we could ascertain, all the cows at one farm were fed in the same way, no attempt was made to vary the amount of feed which each cow should have, excepting that where grain feeding was practised it was usually stopped while a cow was giving little or no milk.

At farm C the owner kept a careful record of all grain bought and fed to his cows during the year. His estimate of this feed is given below :

Estimated Feed Costs and Receipts from Twelve Cows.

* Grain bought during the year		$180 00
30 acres corn stalks, $2.00 per acre		60 00
10 tons clover hay, $5.00		50 00
10 acres good pasture and 15 acres woodland		65 00
Total cost of food		$355 00
Received for milk at Creamery	$572 00	
Sold 12 calves at $5 50	66 00	
	$638 00	
60,000 lbs. skim milk, 10 cts. per 100 lbs	60 00	
Receipts exceed feed cost		343 00
	$698 00	$698 00

* The grain feed consists of corn and oats ground together, corn meal and bran, or about fifteen tons of grain, at $12.00 per ton.

This shows that the estimated cost of feed at farm C was nearly $30.00 per cow, and the total receipts $698.00, which divided by twelve, the number of cows in this hərd, gives a little over $58.00 as the average receipts per cow. Assuming that the manure will pay for the care of a cow, the owner of this herd received an average profit of $28.00 per cow.

Each cow was fed about the same amount of grain and hay during the period of stable feeding—November 1 to May 1. The grain was fed dry just before milking, 10 to 14 pounds per head being fed per day, excepting the dry cows, which received very little grain. Hay was fed the last thing at night after milking. During day time the cows were turned out into a sheltered yard, where they were fed cornstalks that had been stacked near the barn at husking time. The cornstalks were well eaten, and it is possible that the cows satisfied their differences in appetite on the cornstalks, if, as stated, each one was given the same amount of hay and grain. The cows had access to well water during the entire year, and were in pasture from May to November. When cows were fresh the calf was allowed to have its mother's milk for about three weeks, then it was sold for veal.

No exact feeding records could be obtained, except at farm C. At the other farms corn, bran or shorts, ground oats, pasture grass, and a very little hay were fed in uncertain amounts, and apparently with no definite plan. At farm A no money was spent for feed during the year, but the corn and oats raised at home supplied all the grain the cows received, except that some oats were exchanged for bran to give the cows a variety of feed.

Although there was quite a contrast in the feeding and management at the different farms, the methods of weighing and testing the milk of each cow was the same in each case. About $10 should be added to the factory value of the milk of each cow as given in the table. This represents about the average value of the skim milk, 5,000 pounds at 10 cents per 100 pounds, and a veal calf three weeks old.

The extreme variation in the butter value of the cows on the different farms is shown in the following table :—

RANGE IN VALUE OF ANNUAL PRODUCTS.

Received for milk of.	Farm A.	Farm B.	Farm C.	Farm D.
Best cow................	$53 35	$58 20	$60 72	$55 49
Poorest cow	28 72	44 83	37 96	39 60
Average cow............	36 30	50 00	48 83	44 12
No. of cows in the herd ..	12	5	12	4

Since each farmer fed all his cows in the same way there is no evidence to show that it costs farmer A any more to feed the cow that paid $53.35 than the one that paid $28.72. But these figures do not mean that cow No. 1 is worth $53 00 and No. 9 $28.00, because if the feed of a cow for a year costs $30, the profit or loss from each cow is shown by comparing the value of her annual product with this figure. If a cow produced $53.00 worth of butter from $30.00 worth of feed she made $23.00 profit, but another cow producing only $28.00 worth of butter on this same amount of feed was a loss of $2.00 to the farmer.

An inspection of the receipts from the twelve cows on each of the two farms A and C, shows that at farm A there were three cows which did not produce milk enough to pay for their feed. The entire herd only paid a profit of $75.00, and three of the twelve cows paid $50.00 of this amount, while the combined profit of the other nine was only $25.00. In this case three cows earned 100 per cent. more money in a year than was earned by nine other cows on the same farm.

On farm C the twelve cows earned a total profit of $228.00, instead of $75.00 as on farm A, but even at farm C there is considerable difference in the cows. One earned only about $8 00 profit, while another earned nearly $31.00, a difference of about 400 per cent. in the annual butter value of these two cows to their owner. The record further shows that six of these cows paid 60 per cent. of the total profit for the year, and the other six paid only 40 per cent. of it.

A few of the cows tested were such persistent milkers that their owners had som difficulty in drying them off. These cows were all among the greatest producers. Th cows that were dry the longest were generally the smallest producers. This is shown b

the records at farm A, where several of the cows were dry for three or four months in the year.

Most Profitable Month for Fresh Cows.

The market price of butter and cheese goes through approximately the same range of variations each year. During the past two years—1897 and 1898—the lowest prices for butter were in May, June and July, and the highest in September, October and November. This fact convinces many farmers of the profitableness of winter dairying.

The records obtained from these cows furnish some interesting evidence on this subject, as they include cows which were fresh in every month of the year. One cow was fresh in October, and her 262 pounds of butter brought $43.40, while another fresh in March produced more butter, 274 pounds, but it brought less money—$41.04. The average price paid by the creamery for the butter-fat produced by the first was 19.3 cents, while that of the other was 17.4 cents, a difference of nearly 2 cents per pound, due to the season of the year when the cows were fresh.

The method of calculating the factory value of each cow's milk has already been described—the average value per pound of fat for each cow is obtained by dividing the total value of her milk by the total butter-fat which she produced in a year. This figure is naturally raised or lowered by the market price of butter when each cow was producing her maximum yield. As a rule the cows gave the most milk during the first two or three months after calving.

If we group together the prices received per pound of butter-fat for all cows fresh in the various months, we obtain the following table:

AVERAGE PRICE PER POUND FAT RECEIVED FOR THE TOTAL BUTTER-FAT PRODUCED BY COWS FRESH IN THE DIFFERENT MONTHS.

	December.	January.	March.	April.	June.	July.	September.	October.
	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.
	17.4	18.	17.7	18.	18.2	18.6	19.	18.4
	17.1	17.5	17.5	17.7	18.6	18.7	18.5	18.8
	17.6	17.	17.4		18.9		19.2	19.3
	17.7	16.5	17.7				19.5	18.
	16.7	18.	17.9				20.	
Aver.	17.3	17.6	17.6	17.8	18.6	18.7	19.2	18.6

Although there is some variation in the figures for the cows that were fresh in any given month, the agreement is sufficiently close to show that the highest price per pound was received by the cows fresh in September and the lowest by the cows fresh in December.

Previous to making the tests here described, the owners of these cows had little, if any, accurate idea of the relative value of the cows, but the records show that the information is worth to every cow owner many times the cost of a Babcock milk test and the time necessary to use it.

Prof. Farrington then gave a number of stereopticon views, illustrating the benefit of weighing the milk, from each cow in order to ascertain whether it was doing profitable work or not. He also exhibited photographs of typical dairy cows, giving the records of each cow. The exhibits were very interesting, and Prof. Farrington was listened to with rapt attention by the large audience present.

PRESENTATION OF WINDSOR SALT COMPANY'S PRIZES.

The Chairman then called upon Mr. A. F. MacLaren, M.P., to present the prizes given by the Windsor Salt Company.

Mr. MacLaren then presented the prizes to the following prize winners, making a few happy congratulatory remarks in each case.

Industrial Fair	Cheese,	M. Knechtel,	Dorchester Station.
	Creamery Butter,	I. Wenger,	Ayton.
	Dairy Butter,	Jos. Dalson,	Alloa.
Western Fair	Cheese,	M. Knechtel,	Dorchester Station.
	Creamery Butter,	I. Wenger,	Ayton.

PRESENTATION OF PRIZES FOR ESSAYS.

Mr. Ballantyne then presented the following prizes for essays on cheese making :

First Prize Essay, Cheddar Cheese Making, Colin A. Campbell, Stratford, Ont	$50 00
Second Prize Essay, Cheese Making, A. J. Wagg, Guelph, Ont....	25 00
Third Prize Essay, Cheese Making, F. H. Brooks, Lynden........	15 00
Fourth Prize Essay, Cheese Making, Thos. E. Nimmo, Ripley, Ont.	10 00

HON. THOMAS BALLANTYNE : Various influences have been at work to improve our butter. Canadian butter had the worst reputation of any of our articles of commerce, but we have made great strides and the quality of our butter has greatly improved, I dare say, a great deal through the agency of the travelling dairy. The butter we formerly used, nobody would think of using to-day. I have no doubt these essays will help on the work greatly.

Mr. Ballantyne then presented prizes to the following successful competitors for essays on butter making :

1st Prize, J. M. Livingstone, St. Marys	$50 00
2nd Prize, Wm. Waddell, Strathroy.............................	25 00
3rd Prize, W. F. Baskerville, Strathroy.........................	15 00
4th Prize, T. B. Marshall, Tiverton............................	10 00

INFLUENCE OF THE BUTTER AND CHEESE MAKER ON HIS PATRONS.

BY MISS LAURA ROSE O. A. C. DAIRY SCHOOL, GUELPH.

The word "influence" comes from two Latin words meaning, "to flow into," which implies the pouring out of something from one thing to another. The power of influence. acts much like the power in nature. How quietly the rays of the spring sun break the bands which have bound the rivulets, and with what gentle voice do the same rays call forth the snow-drop and clothe in tender green each hill and tree.

So it is with that strange power—influence—we possess, each person coming in contact with another makes some impression. It may be but slight; on the other hand the effect may prove deep and lasting. We do not realize this to the full, else many of our actions would be different.

That which must influence the patrons of a butter or cheese factory, is having confidence in the integrity of the man in charge. No matter how expert a maker a man may be, no matter how many other good qualities he may possess, yet, if he has not the confidence of his patrons, his influence over them for good is null and void.

The other day a gentleman in speaking to me of a man, said, "I don't know of another man I think so much of." I wondered at it, for the man in question was what one might term quite an ordinary man. I better understood the reason, when my friend emphasized his remark by adding, "There isn't a more honest, upright man in the country, he is just as true as steel." There was the secret, and what a power for good such a man is in a neighborhood. The cheese or butter-maker who has a reputation such as this man, dispels all doubt as to whether the milk is properly weighed in, whether the sampling and testing are accurately done, and the returns equitably divided. Such a man exerts a reflex action. Even a rogue shrinks from cheating a thoroughly honest man, while he may consider it quite the proper thing to get even with a sharper.

First and foremost then should be a character for honesty.

Next to this, if you want to inspire confidence in your patrons, you must be a skilled workman. The day is past when old methods, ancient apparatus, and a [illegible] lack of scientific principles will do. The men who make themselves felt are the up-to-date men, men ever ready to grasp new ideas, test them, and if found practicable and an improvement on the old style, adopt them. Science has done much for the manufacturers of dairy products, and it is the men who take advantage of these discoveries, who rise in the estimation of the patrons.

If you want to be a power among your associates you must be punctual. Punctuality is the key-note of character, and the very soul of business. If you have an appointment endeavor to be there on time; if the milk arrives at a certain hour, be there to take it in. If the accounts are to be rendered on a certain date, have them ready even though you may have to sit up late to accomplish it. Punctuality is a habit we can all acquire. A student noted for always being on time came into class one morning and found the lecture had commenced. The Professor, noticing him, took out his watch, and asked of the class the time, and was told it lacked three minutes of nine. "My watch is then five minutes fast; we have commenced too soon." How many of us could regulate a professor's watch, and who can deny the influence of that student?

The loiterer who wastes his own time and that of other men, can neither be respected or depended on. Nelson owed his success in life to a habit of always being fifteen minutes ahead of time.

General Washington had a secretary, who on one occasion came late to an appointment, and gave as his excuse that his watch was out of order. "Then," said the General, "you must get another watch or I another secretary." Some one has said, "Do all you promise to do, and all you are rightfully required and expected to do, as certainly, so far as depends upon yourself, as the sun rises and sets, so that the hearts of all with whom you are in any way connected, may safely trust in you; then you will become pillars of support in the family and in society instead of broken reeds."

Promptness creates an atmosphere of briskness which stimulates and has a tonic influence on all who come within its radius. Those who are unpunctual and procrastinate are usually in the end flustered and hurried; working spasmodically without method or order, and the result is often disastrous to their own interests and perhaps more so to those working with or depending on them.

If one wants to influence those about him and hold their confidence, he must have faith in the business he is at, talk about it in a cheery hopeful way, and not get easily discouraged, even if things do not go along as smoothly as desired and prices drop to an alarming extent. Make those bringing milk to your factory believe it is a good thing and that there is money in it. To enthuse others you must be enthusiastic. Without enthusiasm a life of industry is a dreary, monotonous prospect that will never rise above the level of discontent. What a depressing influence a man without any "go" has, one feels like shoving him along.

Enthusiasm was the distinguishing characteristic of Gladstone. The fire glowed in all his words and actions, and made him the great man that he was. The wide difference between the feeble and the powerful, the great and insignificant, is energy and an invincible determination—a purpose once formed, then a deathless struggle for victory. Many think because they are poor and obscure they have no influence and so become careless and neglectful. Their very poverty may be their safe-guard and means of advancement. It is not the men born rich, but those who by their industry and perseverance have acquired riches, who stand out as landmarks in the commercial world.

Honesty, energy, industry and hope make a four-in-hand, capable of riding over any difficulty and carrying in its train the minds of many.

That which has about as telling effect as anything is the manner of a person. When manners are more than vaneer, when they are part and parcel of the inner man and true self, they indicate the possession of some of the very best and loftiest qualities of heart and mind, as Tennyson expresses it:

> "Manners are not idle, but the fruit
> Of noble nature and a loyal mind."

Manners to some extent may be instinctive, but are usually acquired, and when practised constantly become habitual as the following illustrates: A son of Lady Mansfield's was very ill at his boarding house; his mother went to see him. There was only one chair in the room in which the sick boy was reclining, and a friend who was with him was sitting on the coal scuttle. When Lady Mansfield entered the room, the lad who was sitting on the coal scuttle got up, and with perfectly natural politeness and good-breeding, offered it to her ladyship to sit down upon.

Manners to a great extent make the man in the world's eye. To be polite does not infer a weak surrender of one's convictions to another. It should be the wish and aim

of every man of true courtesy to lend every assistance in his power to those around him, and to show a general, kindly interest in their welfare. It will help him in his dealings with men—for it is hard for a person to be either rude or angry with a courteous, civil man. A soft answer turneth away wrath. If the cheese or butter-maker would acquaint himself with the conditions of the patrons supplying milk so that he could make suggestions, rectify errors, give timely advice or warning, what an influence he would be. For this very reason, it is well for the maker to have as broad a knowledge as he can, not merely along his own special line, but of the general care of cows, of the effect of different foods, of the best methods of handling milk and many other points, that he may be able to direct and instruct his patrons when opportunity occurs. But much tact must be exercised in imparting information else it will be rejected. The "I know all" manner must be guarded against; let the person see you have at heart his best good and prosperity and and depend upon it your words will bear fruit.

Closely coupled with good manners should be careful attention to personal appearance. They go hand in hand. The effect of dress on one's self and those one comes in contact with cannot be estimated. How can a man advise and insist on cleanliness and care in the handling of milk, when his dress, his utensils, his factory and surroundings indicates a total lack of the practice of what he preaches. This is a case where actions speak louder than words. Nothing carries with it such force as a personal application of the theories one advances. A milk driver will be ashamed to drive up to a clean platform on which stands a clean man, and ask him to lift dirty cans from a dirty wagon. I would like to urge upon you all to be as clean and neat in your person, factory and surroundings as is possible. Have your standard of the highest in this regard as it is the most important factor in connection with the dairy industry.

A German, whose sense of sound was exceedingly acute, was passing by a church a few days after he had landed in this country, and the sound of music attracted his attention though he knew nothing of the language. The music proved to be a piece of psalmody sung in most discordant fashion, and the sensitive German would fain have covered his ears. As this was scarcely civil, and might appear like insanity, his next impulse was to rush into the open air, and leave the hated sounds behind him.

"But this too, I feared to do," said he, "lest offence might be given; so I resolved to endure the torture with the best fortitude I could assume, when lo, I distinguished amid the din, the soft clear voice of a woman singing in perfect tune. She made no effort to drown the voices of the companions, neither was she disturbed by their noisy discord; but patiently and sweetly she sang in full, rich tones. One after another yielded to the gentle influence, and, before the tune was finished, all were in perfect harmony."

The spirit that can thus sing patiently and sweetly in a world of discord, must indeed be of the strongest as well as the gentlest kind. One scarce can hear his own soft voice amid the braying of the multitude, and ever and anon comes the temptation to sing louder than they, and drown the voices that cannot thus be forced into perfect tune. But this were a pitiful experiment; the melodious tones, cracked into shrillness would only increase the tumult.

Stronger and more frequently comes the temptation to stop singing and let discord do its own wild work. But blessed are they that endure to the end—singing patiently to the end—singing patiently and sweetly, till all join in.

What better illustration could I use of the influence which one cheese or butter-maker of the ideal type exercises in a community. Let each man before me aim to be just such an influence in the position he holds, not merely doing what he has to do, but doing all in his power to advance the general good of man.

I would urge upon you, to be honest, be competent, be punctual, be hopeful, be courteous, be neat, be clean—then will you be a power among men, and long after you have shuffled off this mortal coil, your influence, like Tennyson's Brook, will flow on and on forever.

The president then introduced Mr. Seaborn, the American Consul.

ADDRESS.

By Mr. Seaborn, American Consul.

I ought not to respond and take up your time at this late hour, but I promise you I will be brief. I was born on a farm, and, to me the dearest spot in my country is my little farm down in the east part of south Pennsylvania. I have driven over the roads of this fine county, and seen your splendid fields, how well they are tilled and cleared of woods, how well they are fenced, and how splendid your buildings are everywhere. There is one thing I would like to call your attention to, and that is, that you ought to beautify your homes, that you ought to plant trees and clean up around your butter factories and creameries. I want you to paint and whitewash your buildings. It will pay. It will pay you in dollars and cents. The boards on the barn will last twice as long. One of the speakers last night spoke on the decoration feature of the farm. He gave a splendid description of your farm life. The crowning glory of your farm is not the acres, the barns, the buildings, the cattle and horses, but your boys and girls. I want you to educate these boys and girls on the farm so that when they came in contact with nature they will love it—and where as the drift now is from the farm to the city, if this right kind of education is instilled in these boys and girls, it is only a question of a few years when they will drift the other way, and they will come to the farm from the city where they ought to have stayed before. The best thing that I have heard at your convention is the talk you have had on honesty, and let me tell you, that the man who is dishonest, whether a merchant or lawyer, or any other person, he who is dishonest, is a disgrace and ought not to be permitted to do business.

The men from New York who made this dishonest cheese and sent them to England are driven out of the market by you to-day, who have an honest article, (applause) and it serves these dishonest New York rascals right to be driven out of the market. "Honesty is the best policy," not only in cheese and butter-making, but in all business; therefore let me repeat that there is nothing I have heard here that has pleased me so much as this constant strain, "Whatever you do, be honest in your work." I have had the pleasure and honor of being in many halls, but I have never been in any hall more suited to the purpose than the one in which you are now meeting; therefore let me repeat, that you ought to congratulate yourselves in the fact, that you have the honor of meeting here for the first time, and let me congratulate you that we are here in the last year of the greatest century the world ever saw, and that we can live in this year of the century in an era of such good feeling, when the relations of the two greatest English speaking nations of the world are so cordial. (Applause). May the Star and Stripes and Union Jack ever hang for freedom and liberty on this vast globe. They are flags that forever stood for humanity, civilization and a better Christianity over the world. One is now fighting to subdue the people in the islands of the great East, and the other in the darkest of Africa, is practically doing the same. It is carried there as a banner to represent a better civilization, and better humanity, and better Christianity. I thank you for your kind attention. (Applause).

THE SUB-EARTH DUCT.

By J. N. Paget, Canboro.

I feel, in coming before you this morning to discuss the subject that has been assigned to me, that it is one of so much importance, that I am incapable of dealing with the question as it should be dealt with. There is no question to-day that is of as much importance to the cheese manufacturer throughout the Province as that of controlling the temperature in our curing-rooms. The sub-earth duct is to some extent a new thing, as the President has told you. They have only been in existence in our country a short time, the Ontario Agricultural College putting in the first that was used in Ontario. They have now used it for two years.

There are now only six sub-earth ducts in the Province, five of them, are I think, in the Western portion of Ontario and one in the East, so in speaking of the sub-earth

ducts, I wish it to be understood that I speak from the experience I have had during one season only. Perhaps that is hardly a sufficient length of time to speak definitely with regard to the value of the sub-earth duct, particularly on account of the season we had last year, which was not considered by cheese-makers one of the worst seasons by any means. We did not have the long period of warm weather that we had the previous season. The nights were usually cool and it was not so difficult to control the temperature in our curing-rooms as it had been during the year of 1898. Prof. Dean, who had a sub-earth duct in 1898, speaks very highly of it; and the season of 1898 was, as most of the cheese-makers in this part of the Province know, one of the most difficult we have had in a number of years. We had them extremely warm weather extending night and day without intermission, for a period of nearly three weeks, when the temperature of a great many of the curing-rooms went up to 90 degrees F., (I was in one curing-room, where the temperature was 88 to 90) and you all know, that where cheese is stored with a temperature such as that, even if put in there in first-class condition, the quality will deteriorate. At several factories ice-boxes are now being used. I have frequently been asked the question, how does the sub-earth duct compare with the ice-box? That is a question I am not prepared to answer, because I have not had any experience with the ice-box, and I only wish to speak of what I know. I wish to point out, that the sub-earth duct is an excellent thing, and is, I believe, the best thing available to-day for controlling the temperature of the curing-room. I wish to say, that a sub-earth duct will not control the temperature in all kinds of curing-rooms. The first thing to consider is the curing-room itself. During the past season, while I had a sub earth duct, and while it reduced the temperature some thirty or more degrees, I did not perfectly control the temperature of my curing-room, for the reason that the curing-room was not properly constructed. A curing-room should be so constructed as to prevent any hot air, or any air, coming into the curing-room except that which comes in through the air duct. You can get cool air from the sub-earth duct, but where you have a curing-room that has openings through which hot air can get in, the benefit of the cold air from the sub-earth duct is counteracted. Therefore, I say, do not depend altogether on the sub-earth duct or on the ice-box, to produce the quality and kind of cheese that the British Markets are demanding. They require a mild-flavored, soft-textured cheese, different to what they did some years ago, and that kind of cheese requires to be kept at a lower temperature during the curing process than the cheese that is harder and firmer. Therefore, I would say the first necessity is to have some proper insulation for our curing-rooms.

The curing-room I used last year has been burnt down, and now I propose to construct a different kind of curing-room. I believe, with a properly constructed curing-room, I can so control the temperature with the use of a sub-earth duct, that it will not go higher than 65 degrees on the warmest day we may have.

Last season we tested the temperature outside. When it showed 92 degrees F. at the base of the pipe, at the base of the intake the air coming into the curing-room was at a temperature of 58, so I believe that, if the curing-room is so constructed that hot air is excluded, the air coming in at 58 degrees will certainly keep the curing-room at 65 or 70.

I wish this morning to speak along the line of the construction of these sub-earth ducts. I have been asked many questions relative to the manner in which the sub-earth ducts are put in. For that reason I had this chart made, and have brought it here in order that I might be better able to convey to you the idea of the construction of a duct. In the first place we dig a drain to the depth of 6½ feet, extending 150 feet from under the factory to the intake; this drain therefore is 150 feet long. I started the drain three feet wide at the top and narrowed it to two and one-half feet at the bottom. In the bottom of that drain I put four rows of 5 inch tile. I think at the College they used 6 inch tile. I put in four rows of 5 inch tile on the bottom and three on the top.

Some people seem to have the idea that it is necessary to put clay on top of the tile and then the other tile on top, but that is not the mode of construction, the tile being placed one on top of the other. At the intake there is a well which I constructed of brick, and the tile came along the drain and about two inches into this well. It is three feet across, and extends to the surface of the ground. Then on top of that I constructed a stand pipe, or intake air pipe, 35 feet high. At the College they used galvanized iron

in the construction of this stand pipe. At my factory I used wood, because I found I could make this kind of a box cheaper than I could procure a galvanized iron one, and I think it answers the purpose equally as well. It is three feet, I think, at the base extending 35 feet in height, and is 20 inches at the top. At the top of the wooden pipe I put a galvanized iron cowl 20 inches across, five feet high, the base of the cowl being made to fit tightly over the top of this pipe, and then, on the top of the cowl, this opening here swings round to the wind. I would advise that the cowl be not less than 3 feet or $3\frac{1}{2}$ across the face. I think this is necessary, though my own was not as much as that, but I believe if it had been that size I would have got better results. Whatever direction the wind is blowing from it will blow into the mouth of the cowl, then the air passes down this pipe into the drain which is where the cooling process takes place. Another important feature in connection with the construction of these air ducts is the length of the drain. There is no doubt the longer your drain is the cooler will be the air coming into your cheese factory. The length of the drain at the College is 90 feet; mine is 150 feet. I believe the longer your drain the more cooling surface you get, and consequently the cooler the air will be as it comes into the curing-room. In my factory I had this drain extending under the building, and then I had a wooden box. I am now going to build a stand box extending into the curing-room above the floor about one inch (so that in reaching the curing-room floor the water would not get into the box), with a slide that can be opened to regulate the amount of air coming in which you can open or close as the temperature of the curing-room requires. There is an opening in the ceiling at the opposite side from that at which the air enters. I have an air-tight box constructed coming down through the ceiling with a slide to regulate the amount of air passing in and out that extends up through the roof and above the ledge. Some people attach a considerable importance to the height or length of this outlet. From my experience I do not consider that of much importance. Some claim this outlet ought to be considerably higher than the inlet. I do not think that it is necessary, but I do think that it is necessary to have the outlet extending above the ridge of the roof sufficiently high that there may be a draught. On the top of the ventilator I have a galvanized iron pipe, with a covering on top to prevent rain and storm coming down, with sufficient opening to allow a current of air to pass through. The cost of an air duct will vary according to the locality in which it is constructed. The greatest amount of labor in connection with the construction is in the digging of the drain, varied by the character of the soil. In some places it would be worth a good deal more to dig a drain 6 or 7 feet deep and 150 feet long than it would in other kinds of soil. The soil in which I made my drain is a heavy clay and pretty hard digging, and I think it would be a fair average of any part of this Province. The total cost of my sub-earth duct was about $80, counting the cost of digging the drain, procuring the tile, putting that in, constructing the intake pipe and all the work connected with it. Of course, that is more than an ice-box would cost but, on the other hand, if you have an ice-box you have to put in a supply of ice which is, in some localities, very difficult to get; where I live we would have to draw ice six or seven miles. With the air duct you have it there all the time, and to my mind it is a better means of controlling the temperature. With an ice-box in the curing-room you are apt to neglect to try to control the temperature until the room becomes heated, and the probability also is you will neglect putting in the ice until the room becomes too warm; but with an air duct all you have to do is to open a slide allowing the air to pass in. It is always ready to be used, and I believe that, in the next five years, there will not be a cheese factory in Western Ontario that will not have an air duct. If you will insulate the curing-room as it should be done you will have no trouble in keeping it cool. Prof. Dean has had greater experience with the sub-earth duct than I have, and no doubt he will be able to add to what I say, but I wish to say, as far as my experience goes which is only one year, I would recommend to every cheese-maker and to every proprietor of a cheese factory to give his attention to the curing-room. I believe that the sub-earth duct is the best means for controlling the temperature that we have.

Mr. DERBYSHIRE: And the moisture in the curing-room is better.

Mr. PAGET: That is an objection I have heard raised frequently to the sub-earth duct, that it brought in air that was too moist. I have only had one year's experience, but I most emphatically say that during the season of 1899 I never saw one particle of mould in my curing-room. I do not think the sub-earth duct is a means of creating mould.

Mr. DERBYSHIRE: You take the ordinary curing-rooms and you have not sufficient moisture.

Mr. PAGET: I believe the sub-earth duct will regulate the moisture better than an ice-box, because I believe the ice-box has too much moisture. I was in curing-rooms last year where the cheese were moulded very much, and in my own curing-room I never saw a bit of mould. The year before we had an ice-box and had a good deal of mould. We merely controlled the temperature as we could, trusting to the weather not to get too warm. I do not think the cheese industry can afford to trust to this kind of method any longer. I believe we ought to be able to thoroughly control the temperature in our curing-rooms. I would like there to be a thorough discussion of this matter because in that way we get pointers, and there are, no doubt, many points that I have not touched upon this morning, so I trust there will be a thorough discussion on this question. (Applause).

Prof. DEAN: There are in the Province of Ontario, so far as I know, sub-earth ducts, at Dunboyes, in Lincoln County; Lyons, Elgin County; Caledonia, Woodburn, Caistorville, and Mr. Paget's own factory at Canborough, all in the section where our worthy president lives. There are also two or three in Eastern Ontario. These sub-earth ducts, so far as I have been able to look into their working, have given entire satisfaction. I have either visited them, or have had letters from persons who have used them during the past season, who all speak of them and their work very highly indeed.

As to that question of moisture and mould I would say that in 1899 we were not troubled with mould to any great extent, that while the sub-earth duct does bring in air which is loaded with moisture, the moisture simply makes the cheese favorable for the growth of mould, but does not, and therefore the sub-earth duct does not, cause mould. In the different factories different sized tile is used, varying from 4 inch up to 10 inch. Instead of having 6 or 7 or 8 inch tile Mr. Williams, at the Lyons factory, has simply two rows of 10 inch tile. He has, I consider, a marked improvement over these cisterns or wells, at each end. He connected the tile with an elbow and used a tile for taking the air from a duct up into the curing-room, simply cut a hole in the curing-room floor and allowed the tile to project into that room four or five inches.

That is much cheaper and to my mind a more satisfactory way of taking the cold air into the room. I made some observations at Mr. Paget's factory on the 15th of August last. He said the soil about his factory would be about the average, but from what I have seen of the earth at different factories, I consider Mr. Paget had one of the worst kinds of soils in which to dig a drain. It was a clay material that caved in and gave a lot of trouble. On the 15th of August, the air outside was blowing at 200 to 500 feet per minute. I used an anemometer for determing the rate of the air outside. The rate of air coming into the curing-room was from 80 to 110 feet per minute. The friction on the tile reduces the rate of speed of the air. The faster it comes through the tile the less cool it will become. Some have become discouraged because they could not feel a strong draught of wind, but if you simply have a moderate flow of air through the tile it becomes cool and will give good results. The temperature on that day, outside in the sun was 92, in the shade 78. The temperature of the air in this curing-room was 64. Mr. Paget has already told you the curing-room was not insulated. The air outside, on the sunny side of the factory, would come through. I considered the results were very favorable indeed, considering that the building was not properly insulated. I visited the Lyon's factory on the first day of August last. The temperature of the day outside was 70 degrees in the morning at about half-past eight. The temperature of the air inside was 67, and Mr. Williams told me that the temperature of the air in his curing-room never went above 70, and most of the time was 64 or 65.

Mr. Elliott, who was a former maker, told me in his report, that frequently the air in that room was up from 75 to over 80 during the hot weather. At the time of my visit, the air outside was blowing from 200 to 300 feet per minute, the air coming into the curing-room from 70 to 110 feet per minute. At another factory I found the whole length of the tile was about 60 feet and only three feet deep; and in another factory, the tile were laid in a sand knoll, and the sand, of course, would warm up quickly. The air coming into that factory was just about the same temperature as the air outside. The temperature outside was 73 and the temperature inside 69.

You must have your outlet pipe high enough to be above all trees. At Woodburn they found on account of the high elm trees on the bank of the creek, that they did not get good results, until they put they intake pipe up 65 or 70 feet. I would say, 1st, be sure and have your intake pipe high enough, and 2nd, have the cowl, which catches the air, with a wide mouth. The cowl should be at least three feet in diameter, four feet is better, and should have the sail so that it quickly responds to changes in the direction of the wind. Have the length of the tile at least 100 feet if you can get it. 150 feet to 200 feet is better. Place them at a depth of at least six feet, eight or ten is better. The temperature of the earth is fairly constant when you get down six to twelve feet.

In the summer time the top of the earth down to three or four feet becomes warm; when you get down six or eight or ten feet the tile does the work you want it do. Put the "intake" of the air into the curing room, so that you can regulate it in the fall and spring You can just make a slide in the floor. I think it is the best to build a little box around the opening, and have a lid on hinges that you can raise up.

The difficulty we found with the slide was, owing to the air being moist, the slide will stick in the floor or grooves where you have it working. Take air in at one side of the curing-room and the warm air out on the other side. If you can bring the air in at two or three different points, it would be best to take the air out at the centre, but if you bring it in at one side then take it out at the other. We have pipes of different lengths, and I find that the draught of air is just as good into the curing-room with a short outlet pipe, as with the long one. It is a simple matter of getting an outlet for the warm air. A sub-earth duct can be built for from $60.00 to $80.00 and I believe will pay for itself in a very short time.

Where you have proper control of the temperature in the curing-room there is less shrinkage of the cheese and less loss of fat. When cheese gets above 70 degrees the butter fat runs out from the casein and is lost, the body and texture of your cheese is destroyed, and loss in weight is caused, while the high temperature is favorable for the development of bad flavors. It has been estimated that the value of cheese is $\frac{3}{4}$ of a cent per pound greater where the temperature is properly controlled, for by having proper control of the temperature you lose less in shrinkage, less butter fat, and have a better quality of cheese. (Applause).

Mr. Bell: Is it necessary to have a drain away from the tile to take away any surplus water that may come into the tile?

Mr. Paget: Yes, I think it is. That is a very good point, for, unless you have proper drains to carry away water, (because there is no doubt that a certain amount of water will come down from the earth to the tile), the water will accumulate around the tile and will certainly create too much moisture in the drain. It is very important to have proper drainage. I drained from the end next to the building. I do not think it is material which end of the drain you take your water from. I have a very great fall from the factory end of the drain, and so no water accumulates in my drain at all. I use 3 inch tile and have the water drain about 6 inches deeper than the air drain, and in the bottom of that I placed three inch tile, so that all the water that gets into the air drain immediately passes off. It is important to keep the air in the air drain as dry as possible.

Mr. Bell: Then you did not make your sub-earth duct perfectly level?

Mr. Paget: No, I have a fall. Where I take of the water is about one foot lower than the other end. It gradually inclines from the upper end to the lower end, sufficient that any water that might accumulate would pass down into the drain and be carried off.

Prof. Dean: The disadvantage of having a water drain near to the factory is that you have a short water drain which connects with your sub-earth duct in which the warm air will enter and to some extent counteract the influence of the cooling of the duct. So I say, wherever possible, have your water drain from the inlet end of the duct, but, if it is more convenient to put it next to the factory, during the very hot weather when there is no danger of the water accumulating, I would recommend blocking up the water drain. At Woodburn they have the water drain in the centre of the duct.

Mr. Edwards: I used a sub-earth duct last season, constructed pretty much on the same principal as Mr. Paget's. There was a difference in the length of the tile my drain being 80 feet long. The only trouble I found with the construction of my duct was in the cowl. I found if the wind went down to a calm it left the cowl sitting at a position

where it did not respond to the next rising wind, perhaps in the opposite direction, the effect being that it brought the air out of the room in place of putting it in. I recommend that that the cowl should be put on so that it will respond to the least breath of air. One morning I went to the factory expecting to see it at 65 or 66, and found it up to 80, which was because the cowl did not respond to the air. As far as I am concerned I would not pretend to make cheese without a sub-earth duct. It saves a great deal of uneasiness at night because you know that your curing-room is cooling while you are sleeping, and it makes it so that you can have your cheese retain as much moisture as you desire. In the old days we had to make the cheese hard and stiff because we did not know what moisture we might have in our curing-rooms. I consider the sub-earth duct will pay for itself in a year in the ordinary factory.

Mr. Bell : Sometimes on a very hot day there is very little air.

The President : I was not always a maker, but worked into the business. At one time I was apprenticed in a factory in the old country. The great question at that time was the question of ventilation, and I remember, on the top of the room where I worked, they had something that worked in the turbine principle and that the very least puff of wind would keep it going and that the ventilation was perfect. Sub-earth ducts are new things, but there is no doubt there are men who can manufacture something that will make them work when there is very little wind. What was done in England thirty years ago can be done again.

Prof. Dean : My observation is that when there is no perceptible wind blowing outside there is no cool air coming into the curing-room. That is one of the disadvantages. I have had correspondence with a manufacturing firm and have seen them personally. They claim they had an arrangement to put on ventilators which when once started will create a current of air right through the curing-room, no matter whether the air outside is blowing or not. They have promised to put one on for us, and I hope before next summer we will have such an arrangement and give it a thorough test. They claim, when they put this arrangement on, you will secure a current of air no matter whether it is placed outside or not.

Mr. Smith : Are there not a great many factories in this country, in which it would be impossible to put sub-earth ducts on account of not being built so that you can get the proper drainage—factories situated on level land ?

Mr. Derbyshire : Supposing you had a factory on the solid rock, and there was nothing but rock around the factory, what would you do ?

Mr. Paget : I think there are not many factories constructed upon a place where you cannot have drainage. In erecting cheese factories throughout the country, an elevated position is selected, where there will be some drainage facilities about the factory. Although you may have some exceptional cases of the kind, they would be very few, and I think we ought not to stop because of a few hindrances, or if one or two factories, or even a dozen factories, could not have proper drainage. I believe some means could be provided for draining in almost every place, because, under ordinary circumstances, there is not a large amount accumulates. I have very seldom seen water running from my air drain, only once in a while after a heavy rain.

Prof Dean : Our water drain is altogether 250 feet in length, on account of the level ground where the factory is constructed. The remedy is very simple indeed. You can use a sewer tile and cement the joints so that the water cannot get in. Where you have a solid rock there are other systems besides the sub earth duct that can be used. I believe the system that is introduced by Mr. Newman, the use of compressed air, will overcome that difficulty. He bought a Westinghouse Air Compressor, and connected it with his engine, and purchased an old boiler to use for storing his compressed air. On visiting his factory, I found that the compressed air was giving entire satisfaction. It costs about the same as the sub-earth duct. The disadvantage of compressed air is that it means continual expense to run the compressor. Where you cannot get the sub-earth duct, I believe the air compressor will give satisfaction. During the process of compressing air it is cooled, and being let into the curing-room, it drives out the warm air and cools the room.

Another way of cooling is by the use of cold water. If you have an abundant supply of cool water, I would recommend putting four or five rows of inch pipe around two or three sides of the curing room, or between the shelves. By pumping the cool water into

these pipes, or where you have a spring, simply letting it run through, they will cool your room. You can also use these pipes for the purpose of warming the curing-room, by having proper facilities and connections.

Then another system they are about to use, is a fan such as is used for blowing sawdust away from machines and factories. It is claimed that the run of this fan will cool the curing-room, so you see we are not restricted to the sub-earth duct, and the man who has a little ingenuity about him, can overcome any difficulty in connection with the cooling of the curing-rooms.

BUTTER-MAKING.

(*First Prize Essay.*)

By J. M. Livingstone, St. Marys, Ont.

The butter-making industry in Canada is a growing and hopeful one. Compared with some countries the business is in its infancy. But we have at our backs almost unlimited resources which in the future should make us one of the greatest butter producing countries in the world.

Butter consists chiefly of carbonaceous or fatty substances of the milk. Water, salt and a small amount of curd, constitute the remaining portion. The elements extracted from the milk in making butter have very little or practically no value for maintaining the fertility of the soils. Hence where a judicious use is made of the valuable products, it fosters the land more than any other branch of dairying.

So much has already been written in regard to the cleanliness in all the stages of this business that it is almost needless to mention the necessity of it, both as regards the production of the raw material and the finished article. But there is evidently room for improvement in this important and absolutely essential factor in the production of butter. Bacteriologists have informed us that millions of germs are swarming in the air, the air and the water of the planet, some friendly and others of the most inimical nature towards the butter-maker. It is impossible for us to conceive of their numbers, and as milk is an ideal medium for the development and reproduction of most germs great skill and care is necessary to guard against their entrance. The sources from which they come are many, therefore, everything with which the milk is to come into contact should be cleaned and sterilized. In addition other precautions should be used, such as brushing the sides of the udder of the cow before milking, having the hands and the clothes of the milker clean, and keeping the milk in a pure atmosphere. Where slovenly or careless habits are practised, dust, hair and small particles of manure, laden with germs, find their way into the milk and give rise to bad flavors. From the foregoing it is evident that a great deal depends upon the habits and principles of the people engaged in this pursuit.

It is impossible to lay down any hard and fast rules to be followed, as circumstances are so variable. Under normal conditions the process is much the same from day to day; but the inborn skill of practical experience is necessary to cope with the difficulties that beset the path of the butter-maker.

Much has been done to educate the patron as well as the maker, but as the foundation for the good qualities of the butter is made or marred while the milk is in his hands, his actions are worthy of consideration. Under the patron's supervision the process is liable to be carried on under divers principles. Some are conscientious and painstaking. Others either from lack of knowledge or carelessness, do not give the milk the proper care. As there is no dearth of information on the care and production of milk, the patron should be given such or referred to works issued by the various experimental stations.

It is necessary that the cow be kept in a healthy and comfortable condition and have access to plenty of pure water. The feeding of foods which injure the quality of the butter should be avoided. As already mentioned, scrupulous cleanliness must be observed by the patrons from the time the milk leaves the udder of the cow until it is delivered to the creamery, where like precautions should be exercised by the maker.

The milk should be removed from the stable as soon as possible to a pure atmosphere, strained, aerated, cooled and gently agitated at intervals to prevent the cream from rising. It is advisable to use a wire strainer, as it is easier to keep pure and sweet. If milk has been allowed to freeze, the flavor will be injured and it will be harder to separate. It is a bad practice to mix the morning's milk with that of the previous night, until cooled to the same temperature, as it has a tendency to cause souring.

There are two systems of butter making in Ontario, the "cream gathering" and the "separating cream." The latter system is more modern and is superseding the former, not that good butter cannot be made by the old system, but because the new is more economical, and on the whole the product is of better quality, and as the cream is all under the supervision of one man.

It would pay the patrons of cream gathering creameries to invest in hand separators, as the cream would be of better quality, and less would be left in the skim milk and the skim milk would be fresh and sweet. There is much less expense in hauling raw material in the cream gathering system, and as this improves the system it will be on a more equal footing with the separator creamery.

In localities where there is a thick cow population and good roads, with outlying districts, where the roads are bad, or the cow population is scattered, a combination of the two systems would probably give good results.

It is necessary for the man who weighs in the milk to have an acute taste and smell, that he may reject all milk that is liable to injure the quality of the butter. If a patron's milk is rejected, the maker should explain the circumstances, and if possible give information that will lead to the removal of the evil source. The most reasonable method of paying for the milk is according to the per cent. of fat contained in it. The method of paying according to the weight of the milk, is based on a fallacy. It retards progress in breeding dairy cows for richness of milk, and discourages dishonesty. In regard to the testing, strict business principles must exist between the maker and the patron. Two great factors which cause disfavor of the Babcock test is the ignorance of the patron and incompetency of the man doing the testing. It has been suggested that a number of creameries secure the service of an expert to do the testing. This appears to be a step in the right direction, as at present there is great dissatisfaction. Composite samples should be taken and tested monthly during the winter, and bi-monthly in the warmer weather. Seven parts bichromate of potash to one of corrosive sublimate give good satisfaction as a preservative. Shake the samples slightly every day to prevent the cream from rising; keep in a cool place during the summer and do not allow to freeze during the winter. If the samples are to be carried any great distance to be tested, as from skimming stations, the samples must gauge the amount taken each day, so that the bottles will be full to prevent churning while being moved.

The milk should be strained into the receiving vat. During the summer it is advisable to heat the milk in a tempering pan to about 82 degrees; but during the fall, winter and early spring, the milk is more tenacious of its fat, and must be heated higher. Heating decreases this tenasity, and gives a better separation. At present it is a disputed point, as to whether heating increases the difference between the specific gravity of the fat and the other constituents of the milk. The main points to be observed in separating milk are the rate of inflow and the temperature of the machine. Some machines give the best results by heating the milk between 95 and 100 degrees; others at a much higher temperature. It is best to skim the cream containing between 30 and 35 per cent. butter, as it takes less labor to handle rich cream, and it also allows a low churning and ripening temperature. Samples of skim milk should be tested to determine the thoroughness of the work. During the summer months it pays to heat the skim milk to 160 degrees, as it increases its keeping qualities, thus making it better food for calves. The whole milk may be pasteurized, but it is more economical to heat the skim milk by passing steam directly into it. There is a diversity of opinion as to whether pasteurized cream or milk gives a better quality of butter than the unpasteurized. Pasteurization has a tendency to destroy the fine aroma of the raw cream butter, and gives very mild uniform flavored butter of increased keeping quality. It has a tendency to free the milk of bad flavors, and may be practiced to advantage where any difficulty is experienced with bad flavors. It also greatly reduces the germ content of the milk, thus leaving it as a clean seed-bed ready for pure seed, which is the lactic acid germ. I think that for some markets, if not

all, a better quality of butter could be made without pasteurization, if we could get a uniform and go d quality of milk at all times of the year. But as a whole, considering the difficulty there is in securing the best quality of milk, pasteurization is beneficial. The Danes have almost entirely adopted this method, and their enviable position on the British market speaks well for it.

A good starter is indespensable in the manufacture of butter. This may be made by pasteurizing a quantity of the skim milk, and adding about one-fourth of pure fresh water. Ripen in a pure atmosphere by adding a little of the previous day's starter if it is good flavored. Good results have been obtained by securing a pure culture of the lactic acid germs, as a mother starter. In the course of time, the starter is liable to go off in flavor. In such cases a new culture should be secured. Some have secured good results by ripening different samples of milk in sterilized sealers, and selecting the best as a mother starter. The best method is to get a pure culture from a bacteriological laboratory. A good starter has a pleasant, sharp taste, acid and smell and should be firmly coagulated.

The cream should be cooled to the ripening temperature, which is between 60 and 75 degrees. A low ripening temperature gives a better body and texture to the butter, but as this means a long ripening period, a deterioration in flavor is liable to take place as the cream is subjected to contaminating influences, for a longer period. The utility of a good starter comes in here, as by means of it we can ripen the cream in a comparatively short period at a low temperature, and the flavor of the starter will generally predominate in the butter. The amount of starter used varies according to the length of time in which the cream is to be ripened. About 10 per cent under normal conditions gives good results. When the cream has developed sufficient acidity, it must be cooled quickly, to the churning temperature, and held at that temperature for at least 5 to 6 hours before churning. When cream is ripened sufficiently, it has a smooth, thick, glossy appearance, and a sharp acid taste and smell. The alkali test is the most accurate method of determining the acidity. The acidity at which the cream is to be churned should vary universally with the richness and directly with the demands of the market for which the butter is intended. Prof. Spillman, of Washington Expt. Station, claims that for every 5 per cent increase of butter fat in the cream there should be a decrease of .04 of one per cent in the development of acid. I think most of our butter-makers develop too much acid in their cream to suit the British market. The Danes churn their own cream with very little acid in it, and some of our best creameries are adopting this method. The butter-maker should aim to have the cream of uniform quality from day to day. The cream must be stirred occasionally during the ripening process to secure uniform temperature and ripening, and again just before straining into the churn. Coloring should then be added if the market requires it.

The object of churning and separating is to reduce the butter fat from a solution to a solid. In churning, the temperature, amount, richness and acidity of the cream should be such as to bring the butter in from 45 to 60 minutes. Too high or too low a churning temperature will cause a deterioration in body and texture ; if too low the mass will be raised by friction to the temperature at which the fat globules will adhere to each other, and if too high it has a tendency to make the globules break up into oil. Under ordinary circumstances a temperature from 48 to 52 degrees in summer, and 52 to 56 degrees in winter gives good results. When the butter begins to break, cold weak brine should be added, as it gives a better separation of the buttermilk and has a tendency to retard the gathering, thus giving a most exhaustive churning. Stop the churn when the granules of butter are as large as wheat grains or slightly larger and draw off the buttermilk.

Have the washing water a few degrees colder than the butter. Instead of washing the butter twice, it is a good practice to leave the faucet of the churn open and distribute water over the surface of the butter until it runs away fairly clear. Then close the faucet, and add as much water as there was cream. Give the churn eight or nine revolutions and draw off the waste water.

The butter may be salted in the churn, or after it has been placed in the worker. If salted in the churn add about one-eighth of an ounce extra salt per pound of butter. Distribute a portion of the salt evenly over the butter, and then give the churn a quarter turn and add the remainder or another portion, and finally the remainder. After giving the churn a quarter turn the butter may then be gathered by giving the churn three or four revolutions. There is less danger of mottles in the butter, and it requires less work-

ing when salted in the churn. The amount of salt varies with the moisture of the butter, and the market for which it is produced. After salting, the butter should be left in the churn until the salt has dissolved.

The excess of moisture is extracted from the butter and salt evenly incorporated by working.

In order to secure a good body and texture this must be done with as little friction as possible. The butter should leave the worker with a firm waxy consistency. An even distribution of the salt is indicated by the color, and should not contain much free moisture. It should not be too cold and hard on entering the worker, as it will require a great deal more working to get an even distribution of the salt, and the butter is liable to be mottled. During the winter the room where the butter is to be worked should be of a moderate temperature and warmer than the butter One working is sufficient if the operator knows his business and can tell when the butter is worked enough.

An article which has been done up in a neat and attractive form will generally find a ready sale, other qualities being equal, and in packing and finishing our butter it is well to bear this in mind. For export, pack in 56 pound boxes or 112 pound barrels, which have been well paraffined, and lined with heavy parchment paper which has been soaked in brine. Pack the butter solidly and have no air spaces. Pack from the centre towards the outside, as in this way you expel the air and leave no holes. About a pound extra for each box is sufficient for shrinkage. Level the top off the butter being careful not to make it greasy, cover with a piece of parchment paper, and put on a thin layer of salt paste to exclude the air and prevent moulding. If the butter is not intended for immediate consumption put it in cold storage, as no matter how perfect it is when made, it soon deteriorates if left in a warm atmosphere. Hence it is necessary for every creamery to have a cold storage which may be kept as low as 40 degrees. The air of the cold storage must be pure and sweet as butter is very susceptible to bad odors.

It is necessary that the creamery be centrally located, and that the sanitary conditions be of the best. It is essential that there be plenty of good water and that the creamery and the utensils be as clean as a scrubbing brush, warm and hot water and steam can make it. If the maker takes any pride in his work this place will be neat, attractive and orderly. The demand for a first-class article is likely to increase as many of the European countries have almost reached the limit of their capacity for production. The consumers will increase and may be expected to increase, but the land which is necessary for the production cannot increase.

This business, like all others, is carried on purely for the profits that it returns. The greater we can maker our profits, the most successful the business. Therefore, we must study to increase the profits. This may be done by cheapening the cost of the production and by making goods of superior quality. We must seek to get the largest possible return for the labor and capital invested. There is too much idle capital in this business. Too many of our creameries are running at half capacity, and in many cases shut down for a part of the season. Undoubtedly, one of the greatest causes of this idle capital is the lack of raw material. The manufacturer is dependent upon the producer of raw material, and must stimulate him to produce first-class milk. The manufacturer must turn out the best finished article in the market, which means the top prices and the greatest profit both for the patron and himself.

This will induce the patron to produce a better quality and quantity of raw material, as he will realize that there is money in the business. If we could pay patrons according to the quality of their milk it would have a tendency to make them take better care of it. For any degree of success it is necessary that the patron and manufacturer work together, as neither can produce a superior article independently.

There should be a mutual good will and understanding between them. It is evident that neither can shirk, but success depends equally on both. If we can run our creameries up to their full capacities it will cheapen the cost of production, and will be more profitable both for the producer and the manufacturer. Both must be alert, as these are days of strong competition. A course at a dairy school is to be highly recommended as it gives a broader and more intelligent knowledge of dairying.

At present the Danes bear the standard in the world's markets. We must discover the secret of their success and adopt their methods or originate new ideas. Possibly many in Ontario produce butter of as good a quality as is produced in Denmark, but our

butter lack uniformity. We have not the name. The creamery on the skimming station plan turns out a large quantity of butter of uniform quality, thus gaining a reputation. I think that if a number of creameries would carry on the same process in manufacturing, and ship under the same brand they would gain a reputation and secure a higher price. If such a case a reliable inspector should be appointed. A small amount of butter sent out under a certain brand never gets an established name in the old country markets. Above all things the butter should be shipped out of the country under its true colors. If it is first-class, it should be branded such, and no inferior article should be sent out under that name. It is only by honesty and intelligence that we can build up a name for ourselves in this business.

BUTTER–MAKING.

Second Prize Essay.

By Wm. Waddell, Strathroy.

As flavor is the essential point in determining whether butter is first-class or otherwise, it is of first importance that the butter-maker should look well after the manner by which the milk he is to handle is produced and cared for, before reaching the creamery as well as after.

Milk should be received only from cows that are in good health and breathing good air. This is especially necessary in the winter season, when cows may be kept in poorly ventilated and foul smelling stables, but it is also important when cows are on the pasture, as foul odors in the pasture, caused by decaying matter of any kind, will injure the flavor of the milk and make it unfit for manufacture into a first-class article.

Cows must not be allowed to eat any kind of a food that is injurious to the quality or flavor of the milk ; especially must all kinds of decayed or musty food be prohibited. Abundance of pure, wholesome water must be supplied, and free access to salt at all times. Cows' udders should be carefully brushed with a soft brush, or washed before milking. Loud talking, unusual noise or rough handling of cows should not be allowed while milking.

If bad flavored milk is being received from any patron it will be the duty of the butter-maker to visit that patron and examine carefully the cows as to health, their food and water, if it is pure and wholesome, the surroundings as to the purity of air. The cleanliness of pails, strainers and cans, dippers and utensils used in handling the milk, also as to whether milk is properly aerated and cooled to a proper temperature, and kept over night where air is pure and circulating freely. Milk for butter making should not be kept over night at a temperature above 70 degrees, and should never be cooled to a temperature below 60 degrees unless to be kept for a longer period or over Sunday, as the ripening process is to some extent going on all the time, and the germs that produce that kind of flavor required in the butter do not thrive at a higher temperature.

Milk wagons should be kept clean and free from any impure odor that might impart a bad flavor to the milk. When the milk arrives at the creamery it should be taken in as soon as possible and carefully sampled, weighed, the weight recorded, and the milk strained. Samples should be taken as soon as the milk is poured into the weigh can and before any cream has had time to rise. Samples may be conveniently taken with a half oz dipper with a long handle and a hook to hang on the inside of the weigh can. Preservative should be added to sample bottles previous to the addition of any milk, and if samples are to be kept for a month, should consist of chloride of mercury one part to bicromate of potassium eight parts. As much of this can be conveniently lifted on a ten-cent piece should be added to each bottle. Samples should be carefully shaken every day (Sunday included), care being taken not to churn the sample, or leave any cream sticking to the sides of the bottle. Samples should be kept at a temperature below 60 degrees in summer and above freezing in winter.

Heating and Separating.—Milk for separating should be heated to a temperature of from 70 to 100 degrees, F., according to the season of the year and the kind of separator to be used, but should be separated at as low a temperature as possible to

get good results. Care should be exercised in heating that the milk may not be scorched or burned. The heating of milk food and running of separators should be regulated so that the loss in skim milk will not exceed .05 of one per cent. The per cent. of fat in cream may be varied from 25 to 40 per cent., according to the season of the year. A rich 40 per cent. may be taken in summer and will have less bulk in cooling, can be churned at a lower temperature, giving a more exhaustive churning and better grain in the butter. A thinner cream, 25 to 30 per cent., may be taken in winter, and as a greater proportion of skim milk in the cream will assist in the development of acid at a season when the cream is like to be sweet. If flavor of cream is not good, it may be improved by pasteurizing or heating to a temperature of 156 to 160 degrees, F., and cooling to a ripening temperature. Heaters for this purpose may be obtained, requiring very little steam for heating. Coolers may also be obtained that will easily reduce the cream to ripening temperature while passing over them with a fair amount of cold water, without the use of ice.

Cream should be well stirred as soon as separating is completed to mix in any froth that may be on the top, and which will not mix if left till later. As soon as possible after separating, cream should be cooled to a ripening temperature, which should be as low 70 degrees, F., or under, and starter added.

Starter should never be added to cream at a temperature higher than 70 degrees, as the germs producing the rich creamery fresh flavor so essential in butter, will not develop at a higher temperature, but germs developing a flavor not desirable, will grow very rapidly. The grain of the butter will also be injured, if cream is held at too high a temperature. The amount of starter to use will vary from 3 to 15 per cent., according to condition of cream, and the time required to ripen.

It is an advantage to use starter in cream at all times. If the flavor of the starter is good (and no other should ever be used) the flavor of the butter will be improved and same flavor will be retained from day to day. If acid is well developed when cream comes from the separator less starter should be used, and cream held at a lower temperature, so that the ripening process will not be developed beyond the point desired when ready to churn. Care should be taken to have cream well cooled down to a churning temperature before it begins to thicken, as it is very difficult to cool a thickened cream. A proper churning temperature is a temperature at which cream will churn readily in from forty minutes to one hour. If cream is so cold that butter does not gather readily, the loss in buttermilk will be much greater than if churned at a higher temperature.

If butter is put up in prints for Canadian trade, the ripening process should be farther advanced than if intended for the export market. If the right flavor is in butter for export at time of churning, and butter is kept at a low temperature till it reaches its destination, flavor will go on developing, and when it reaches the consumer, will have reached just the point desired. Whereas, if making butter to be consumed immediately, we must develop the flavor in the cream to that stage which will suit the taste of the customer.

The expert butter maker will easily detect the proper acidity of his cream for churning by its consistency and glossy appearance, and by raising in a dipper and pouring into the mass.

The proper acidity may also be found by using alkaline tablets or tablet solution The amount of acid on cream will depend on what market the butter is intended for, and will vary from 5 to 6 per cent. A rich cream, well ripened with churn not more than two-thirds full, will churn readily at a temperature of 50 degrees, F., and give a loss in the butter-milk of less than 1 per cent. And if a loss greater than this is found at any time, something is wrong. Cream may be too thin or not properly ripened. Too much or too little in churn, temperature too high or too low, or not properly handled in some other particular.

Churn should be carefully scalded with boiling water and well cooled. Plenty of cold water should be used, especially in hot weather, that all heat from the hot water may be taken out of the wood. Cream should always be strained into the churn, to take out any lumps or curded matter, and prevent white specks in the butter. If the market demands it, color should be added before the churn is closed. The amount of color to use will depend upon the season of the year, kind of color, and requirements of the mar-

ket. Churn should be stopped and gas let out several times during the first ten or fifteen minutes.

When butter begins to form, one or two pails of water, with about one pound of salt with each pail of water, should be added. Temperature of water to be regulated by the temperature of the cream. If the weather is warm, and the cream has risen in temperature while churning, water should be as cold as possible. If cream is cold and butter is likely to be firm and difficult to gather, water may be as high as 58 or 60 degrees F. Cream should never be churned at so low a temperature that warm water has to be added, as it will injure the grain of the butter. If difficulty is found in getting the butter granules large enough, a portion of the buttermilk should be drawn off. When granules are the size of large clover seed it is churned enough. If left too small, they lie so close that buttermilk will not drain or wash out readily, and if too large the granules will enclose a portion of the buttermilk that will not wash out.

When churning is completed, churn should be allowed to stand three or four minutes, till butter has all risen to the top, when buttermilk should be all drawn off and allowed to drain for 15 minutes. As much water as there was buttermilk should then be added, and the churn revolved twelve to twenty times, when the water should be drawn off. Temperature of water for washing will depend on the condition of the butter. If weather is very warm, and butter is likely to be soft, water should be as low as 45 degrees F. If weather is cold and butter is likely to be too firm, water should be as high as 55 degrees F.

If butter is only to be kept for a reasonable length of time, once washing is preferable. If butter is to be kept for a longer time, it may be necessary to wash twice. But twice washing always destroys some of the choice richness of the flavor but may add sometheng to the keeping qualities of the butter.

Water should be drawn off and the butter allowed to drain 15 or 20 minutes, when it is ready for salt. Only some brand of first class dairy salt should be used. The amount used will be regulated by the market the butter is intended for, much more salt being required by the Canadian trade than for the export market, and the amount may vary from 1-8 of one ounce per pound to 1 1-4 ounces per pound of butter. If a room is convenient where butter can be held at reasonable temperature (55 degrees F.) the salt may be added to the butter and partially worked and put away for four or five hours, when the working can be finished. This method will give a better grain in the butter, as the mixing of the salt will be accomplished with less working. If churn is not immediately required for a second churning, butter may with advantage be salted in the churn, and the churn slowly revolved a few times to mix the salt, then if left standing for an hour or two with the churn closed to control the temperature, the mixing of the salt will be accomplished with less working and the grain of the butter preserved. Butter may also be taken from the churn, weighed, placed on the worker, and salted and worked immediately, care being exercised to work enough to thoroughly mix the salt and remove all streaks, but not to overwork and destroy the grain of the butter. No more butter should be handled at one time than the capacity of the worker and the skill of the operator can handle efficiently. If butter is to be printed it will be found to print better two hours after being worked if held at a proper temperature—50 to 55 degrees. If butter is to be packed it should be put up in packages to suit the market. The most convenient and suitable for export is perhaps the 56 lb. box.

Boxes should be strong, light and neat, and clean, and made from timber that will not impart flavor to the butter. They should be well paraffined inside and lined with heavy parchment paper, which should be soaked in brine for at least six hours before being used. Butter should never be packed in a box made from green wood, and never in a very dry box. Care must be taken not to pack too much into the box at one time, as butter should be perfectly solid in the box. Boxes should never be allowed to stand after being lined to allow paper to dry, and immediately on being filled should be trimmed off smooth and papers neatly laid on top while still wet; a neat covering cannot be made if papers have become dry. A heavy paper should then be placed on top, and if your market demands it, a salt paste put on top, which will help to preserve the top of the package, and exclude the air from the butter.

Boxes should be placed in jute bags to keep them clean that they may reach the market in good condition. Butter in hot weather should be placed at once in cold storage, and for best results kept at a low temperature till it reaches the consumer.

The method of selling and disposing of the butter should be left to the good judgment of the man in charge, who should always endeavor to obtain the best possible price and make returns as regularly and as promptly to patrons as efficient management will permit.

To get a ferment a commercial pure culture may be used, but as good flavor may be obtained by getting some milk from a good healthy cow, fed on wholesome food with plenty of good, pure water, and regularly salted. A cow that has been milking about two months is preferable. The milk should be carefully strained and well aerated and cooled to a temperature of 68 degrees F., and held at that temperature and kept where air is pure until acid develops.

To Make Starter for Ripening Cream.

Take skim milk, quantity required, heat to a temperature of 156 to 160 degrees F., carefully stirring while heating to avoid burning. Hold at this temperature for twenty minutes, then cool to a temperature of 70 degrees or under. Take ferment previously prepared, skim off one inch from top and discard, mix balance thoroughly by pouring back and forth and add 1 per cent. to 5 per cent. to pasteurized skim milk, and also add 10 per cent. to 15 per cent. of cold water. If there is any doubt about the purity of the water it should be added to the skim milk and pasteurized along with the milk. This should be carefully mixed, placed where it will not be moved or jarred.

When wanted for use the top should be taken off and discarded and the balance carefully broken up by pouring back and forth. This may be repeated from day to day for an indefinite period as long as the flavor remains good.

The great secret of making and preserving a good starter is never to expose ferment to a temperature above 70 degrees F. Add just enough ferment that starter will be well thickened when wanted for use, but acid not too far developed.

When starter is to be kept over Sunday, milk should be cooled to a lower temperature and less ferment used.

BUTTER-MAKING.

By Professor Farrington, Madison, Wis.

The subject of butter-making is one about which a good many people could write a book You have already seen there are a great many men here who can write long essays with regard to it. So, rather than go into a resume of butter-making, I would prefer to ask some questions. I will ask first if there are any butter-makers here who make any attempt to test the purity of milk as it comes to the factory. Of course I know you all smell it and test it; have you any test with regard to it?

Prof. Dean: Fermentation tests are in use in our factories as a rule.

Prof. Farrington: If you haven't used these tests I think you should. You may be convinced yourself that the milk is not fit to use, too sour, or has a bad flavor, but unless you have some test besides your own senses you may have considerable difficulty in convincing the farmer. It is just a question between two people as to whether the milk shall be taken or not. If you have a means of testing the milk right before the farmer, and can show him that the milk is tainted in some way, that it would spoil your butter. I think it would help a great deal in getting pure milk.

Mr. Ballantyne: What is the process of making these tests.

Prof. Farrington: One test is an acid test, and another is the fermentation test. We call it the Wisconsin Curd Test. It would take almost as much time to describe one of these tests as to write a paper. The fermentation test takes twelve hours to make, but these tests will help to convince the farmers that the purity of milk ought to be improved.

Prof. DEAN : The difficulty about these fermentation tests is that you may test the milk to-day, and it may be bad, and to-morrow it may be all right, and it may be right for several days. We have tried that at our Dairy School, but have not found it satisfactory for that reason.

Prof. FARRINGTON : I wish to call attention to the fact that these tests exist, and that in some places they are used with a great deal of effect.

Mr. WAGG : I tried the fermentation test this summer, and found the same trouble Professor Dean speaks of, but I found it a good way to convince the farmers that their milk was bad. I sent one man's milk home twice, and he came back to the factory intending to tell me that he would not send his milk to the factory any more, but when I showed him that his milk was bad, we discussed the different methods of keeping the milk, and he continued to send the milk. In several other instances it proved satisfactory in showing the patrons that their milk was bad.

Prof. FARRINGTON : It helps the man who is receiving the milk in his arguments with the patron. It gives him something beside the mere statement that the milk is bad. This fermentation test is used in Wisconsin by the travelling instructors almost entirely. If they have found trouble at the factory the first thing they do is to take a take a sample of the milk of each patron that is being sent to that factory and make the fermentation test of it, and so they will locate the trouble at some farm. Then they will go to the farm and make a test of each cow, and there have been instances in which it was found one cow was responsible for the entire difficulty of the cheese at the factory, she was sick and the milk she produced was impure. Are there any butter makers here that heat the milk by forcing the steam directly into it ?

Prof. DEAN : No, we do not use it.

Prof. FARRINGTON : I am glad to hear that. A great many factories in Wisconsin are equipped for heating the milk by forcing the steam right into it. That is not a good way to heat the milk ; it should be heated by passing over a hot surface, and not by heating it with direct steam. How many times during one run do you test skim milk ? Do you just take one sample while the separator is running in good condition and consider that a test for the day ?

Mr. PAGET : Generally take two.

Mr. BRODIE : We generally take two or three times during run.

Mr. BALLENTYNE : Customary to take it every day, or only just occasionally ?

Mr. PAGET : We used to take it every time. Now we have got careless and only take it every day or so.

A MEMBER : We have adopted a system of having a little drip-cock attached to our skim milk pipe, and fixed so that you will just occasionally get a drop.

PROF FARRINGTON : That is a point on which I think some people have made a mistake. When everything is running in good style, the separator up to full speed, and the milk heated to the right temperature, they will take a sample at that time and say, that is what the separator is doing, and the test of the skim milk may be away down. I think if you would make some such arrangement as this gentleman speeks of, so that you would take a composite sample during the whole run, you will find the skim milk will not test so low as it does when you test only one sample during the run.

With regard to the ripening of the cream, that is a question on which we could discuss a great many points. But I think there is one thing everyone should bear in mind with ripening cream, and that is to ask for what purpose are you ripening the cream ? Will some butter-maker tell me for what purpose you ripen the cream ? First, we would say you are ripening the cream to get the best flavor in your butter. Another purpose is to get an exhaustive churning. I won't stop to discuss either of these poirts. I want I want to impress that one point upon your mind, to think for what purpose you are ripening the cream, and after you have thought of that for a while, try to think of the different things that influence the rate at which the cream ripens.

A MEMBER : I would like to ask a question in answer to your question. What are the keeping qualities of butter ?

Prof. FARRINGTON : I think that depends a good deal upon the amount of curd left in the butter.

A MEMBER : Doesn't the ripening of the cream give you the keeping qualities of the butter ?

Prof. FARRINGTON: Certainly, that is one of the purposes for which you ripen cream. The rate at which the cream ripens after it is in the vat has on influence upon the thickness of the cream. Thin cream will ripen faster than thick cream. The rate at which the ripening progresses is also influenced by the time at which you hold it at a certain temperature, as it is also by another thing, the number of bacteria left in the cream, and the condition of the milk. The bacteria in the milk are carried into the cream, and then a number of bacteria get in the cream through the starter, and perhaps the most important influence of all is the temperature of the cream. I presume all these factors are familiar to the butter makers here. There is one more point I want to mention, that is the churning temperature.

Prof. DEAN: Have you decided what you think is the best temperature at which to ripen cream? Would you recommend any particular temperature?

Prof. FARRINGTON: No; I think the temperature it influenced by so many conditions. The thickness of it is one thing, and the condition of the milk from which the cream is made is another thing, as also is the amount of starter that you add to the cream in order to ripen it, so that I do not see that there can be any hard and fast rule laid down as to the proper temperature for ripening cream. The way we ripen cream is to test the acidity of it. When it has reached a certain acidity we know we ought to at once commence to cool the cream and hold it until we churn it.

Mr. BALLANTYNE: At what temperature do you hold in the early stages?

Prof. FARRINGTON: After the cream comes from the separator, at a temperature of 75 to 80, we cool it down to 50. Then if you can heat it up to 70, and hold it five or six hours at 70, I think you will develop the flavor during that period; then after holding it five or six hours at 70, immediately cool it down to about 50, and hold it at a temperature of 50 until you are ready to churn.

Prof. DEAN: Why the first cooling?

Prof. FARRINGTON: I do not know that it is always necessary, but we think that it hardens the fat globules and gives them plenty of time to crystallize, and helps the man with the butter.

Prof. DEAN: If you warm it up again, you simply have undone what you did?

Prof. FARRINGTON: Actual experience has shown that it does have some effect on the body and texture of the butter.

A MEMBER: About how much acid do you develop before commencing to cool?

Prof. FARRINGTON: We adopt about four-tenths of one per cent. acid as the amount we develop in the cream before we cool.

Mr. SMITH: How long do you give it to cool?

Prof. FARRINGTON: Generally allow four-tenths per cent. of acid at six or seven in the evening, and allow it to cool all night before churning the next morning. I think perhaps two hours would be the minimum time you should allow cream to stand during the cooling process.

Mr. SMITH: What length of time from the finishing separation till the four-tenths of acid would be developed?

Prof. FARRINGTON: That would depend entirely on the temperature at which you held the cream. If you held it at a temperature of 75, and had starter enough, you might get up this four-tenths in one or two hours.

Mr. SMITH: Do you prefer to ripen cream quickly, or take all day to ripen it?

Prof. FARRINGTON: I think it very much better to ripen it quickly, although I do not think it is a hard and fast rule that you can always follow.

Mr. SMITH: Don't you think we better control the flavor of the cream by developing the acid quickly and preventing any other flavor from developing?

Prof. FARRINGTON: Yes, that was the statement I made, that I should prefer to develop the acid up to four-tenths as quickly as possible, ripen at a high temperature for a short time, rather than at a low temperature for a long time.

Miss ROSE: If a low temperature produce the best flavor in cheese, why would not it produce the best flavor in butter?

Prof. FARRINGTON: I think, perhaps, one reason is that in the curing of cheese you hold it a much longer time at a low temperature. If you held your cheese at this high temperature it would spoil. Curing cheese takes days and weeks and months, and ripening cream is done in the twelve hours.

Prof. DEAN: If you had ideal conditions, don't you think the same principle applies? Don't you think you would develop better flavor by ripening at a low temperature, and taking a longer time?

Prof. FARRINGTON: I do not know that I can answer that question. I think you will get a good flavor either way. I do not think you can say you will get a better flavor by ripening it a long time at a low temperature. I think if you have ideal conditions you get good flavor in your butter either way.

Mr. SMITH: Is not one of the benefits of ripening quickly and cooling down early, that the butter-maker has the cream at a churning temperature for a greater length of time before churning, and you have your work done before you leave in the evening, and you get a better body and texture in your butter?

Prof. FARRINGTON: Yes, I should think it would be a good plan to begin your cooling in the afternoon and let the cream stand at this low temperature of about 50 over night. I think it is a good thing for the butter to hold it at a low temperature as long as possible.

Another point is the churning temperature. If you were going to report the temperature of the churning when would you take that temperature?

A MEMBER: I think it is very necessary to take the temperature when you are putting the cream in, and also when you have finished.

Prof. FARRINGTON: I want to emphasize this point, because it is one in which our students have difficulty. They put the cream into the churn and put the thermometer into the cream, and they say that is the churning temperature, but that is not so. The churning temperature is the temperature of the butter-milk at the time the churning stops.

A MEMBER: What amount of acid do you develop at the time of churning?

Prof. FARRINGTON: We like the cream, at churning time, to have acidity of between five-tenths and six-tenths of one per cent. I think there are times when cream is so poor, and you have so poor a starter, that you can run the acid up to nearly seven-tenths of one per cent., but as a rule we adopt five-tenths or six-tenths.

A MEMBER: Will the friction in the churn raise the temperature?

Prof. FARRINGTON: I think it will. I do not think any butter maker has a thermometer that will measure the temperature that is caused by the friction in the churn. There is only one more thing I want to mention, and that is the result of some experiments we made with regard to the amount of water left in the butter.

Mr. SMITH: Is there any great difference in the amount of fat left in the buttermilk as the result of the different temperature in the churning?

Prof. FARRINGTON: Yes.

Mr. SMITH: Much more lost in churning at high temperature than low?

Prof. FARRINGTON: Yes, and the amount of butter lost in the butter-milk depends not only on the temperature of the cream, or the churning, but also on the thickness of the cream which you are churning.

Mr. SMITH: You can churn sweet cream at much lower temperature.

Miss ROSE: By thickness do you mean percentage of butter fat?

Prof. FARRINGTON: Yes, richness of cream.

Miss ROSE: Which would be the least loss?

Prof. FARRINGTON: If you want to churn this cream you must churn it at a temperature of 60 or above. If you try to churn with sweet cream at a low temperature, you will have to churn for a week or two, and then the butter won't come. I would call thin cream, cream that contains from fifteen to twenty per cent. of fat. There is very little separator cream that is so thin as that. Cream containing fifteen to twenty per cent. of fat should never be churned at a low temperature, sweet. If you want to churn thin cream you should sour it, and churn at about 60. If you get a cream containing about thirty-five per cent. fat, you can churn that sweet at a low temperature. If you churn thick sweet cream at a temperature of 45 or 50 you can get a very exhaustive churning. But if you churn that thick cream sweet, at at a temperature of 65 to 60, I think you get a very rich buttermilk. If you combine the acid of the cream with the richness of the cream, you can churn that cream exhaustively at a temperature of about 52.

A MEMBER: I would like to solve the difficulty we have in our factory. It is a co-operative factory, and we find difficulty in satisfying the patrons on the test. They

claim that, if they thoroughly mix the cream and keep part of it at home to churn it, they get more butter out of it than we give them credit for. We made over seventy-five tons of butter this last summer. It is a cream-gathering factory.

Prof. FARRINGTON: That is a question that comes up in our creamery very often. We get the milk from sixty farmers. They are always complaining. It is simply a question of how to convince them that you are honest, and to make them continue to think it the entire year. I ask them to come in and see the cream tested, and we test it as it ought to be tested. That is the only way I can suggest to you.

A MEMBER: The difficulty is to convince them that we get all the butter-fat out of the milk they are sending. They are under the impression we are not taking the butter out of it, but that it goes off in the buttermilk.

Prof. FARRINGTON: If I were you I would give them a pail of buttermilk and let them take it home, and see if they could churn any butter out of it. (Applause.) Another suggestion I might make to help you. If you have a Babcock tester it would be a good plan to save samples of your buttermilk, and show them samples of the test by the Babcock test, and I think you could demonstrate to them that you were getting all the butter out of the cream.

A MEMBER: Do you think it would be honest butter that was made in these home dairies? I have found that sometimes they haven't got proper scales for weighing their butter.

Prof. FARRINGTON: I have found in a number of farm they haven't proper scales for weighing anything. It may be possible your farmers were not weighing your butter.

A MEMBER: I have had conversation with customers at the creamery, who have stated honestly to me, that, during the hot weather, the test was higher than they could make themselves during churning.

A MEMBER: We use the oil test. Is there anybody here who could suggest a better test?

Prof. FARRINGTON: I do not see why you could not apply the Babcock test.

A MEMBER: The cream-gatherer would require to have scales.

Prof. FARRINGTON: The details of that method have all been worked out and published in some books and bulletins. The cream-gatherer goes to the farm; he has a scale in his wagon, and he also has a pail. He goes into this farm and pours the milk into this pail, hangs the pail on the scales, takes a sample of the milk after he has recorded the weight, and then pours the cream into the tank. I do not see why they could not use these spring scale balances here.

Prof. BALLANTYNE: The spring balances are prohibited here by law.

Prof FARRINGTON: Every farmer should have a beam scale.

A MEMBER: I have made a good many comparisons between the oil test and the Babcock test, and I have found one just as correct as the other.

Prof. FARRINGTON: I have heard that same statement before, that some men can use the oil test with satisfactory results, but I never heard anyone complain that they could not get satisfactory results with the Babcock test.

Mr. DERBYSHIRE: How do you divide the skim milk?

Prof. FARRINGTON: Our rule is to give them back about 80 per cent. of the whole milk, which the farmer takes back as his share of the skim and we weigh it.

A MEMBER: Can we possibly get as good quality from cream raised in a shallow pan as in the shot gun can?

PROF. FARRINGTON. I do not think you can. The milk set in shallow pans is apt to accumulate bad odors and is not nearly so pure as cream raised by setting milk in shot gun cans in shallow water. I wish any butter-maker present would give me his idea as to what influences the amount of water left in the butter. Of course you know that with the Babcock test the separation that is made is pure fat, and that you don't get the exact butter value of the milk. You find out how much butter fat there is in the milk, but butter is not only composed of not only butter fat but also of about twelve per cent. water, four to five per cent. salt, and one per cent. curd. The amount of water that butter holds varies a great deal and this is influenced by a number of conditions during the process of making.

Mr. BELL: One cause of that would be insufficient working.

PROF. FARRINGTON: How do you judge as to the water contents of butter? How can you judge as to how much water there is left in butter? By its appearance? By the amount of brine that leaks out of the package? Or by what method do you determine that? Perhaps I had better give my own experience in some experiments I made this summer. At the Sault Falls Convention of the National Creamery Association held last winter, about this time, there was an exhibit of about twenty different packages of foreign butter. The United States Government sent to London and bought samples of butter in the London market imported from a great many different countries: French butter, Danish butter, Irish butter, Swedish butter, Australian butter, and Canadian butter, about twenty different kinds altogether. We all had an opportunity of examining the butter from each one of these countries, and of comparing it with the six hundred samples of American butter then competing for prizes. There were some striking peculiarities of this foreign butter as compared with the American butter. One thing we noticed was that most of the foreign butter had a very dry appearance. When you cut off the package at the top it was very seldom that the brine would show on the freshly cut surface. It would look as if the butter was perfectly dry, while in the American butter in almost every case when you put a tryer into it or cut it off with a wooden ladle there would be streaks of water or brine follow the cut surface. As soon as I left the convention I took up that subject in our station to see if I could discover any reason for this difference in the appearance of the two butters, and I made a great many experiments. We found by churning the cream in one churn and dividing the butter from the churn into two parts, working one half on a table worker at once, then giving it a certain number of revolutions and working it without any salt just as it came from the churn, then putting it in a package and setting the package to one side, and then taking out the other half and salt it one ounce to the pound, as is the American rule, and working that butter the same number of revolutions and putting that in a package; and then comparing these two packages; (the second lot was salted, the first lot was not salted, both were worked the same number of revolutions.) We noticed in every case, that the salted butter had the appearance of drops of moisture or brine upon the surface. The appearance of brine on the salted butter was much more prominent than it was on the unsalted butter. We next analyzed these two packages of butter to find out which one did contain the most water. Tho natural inference was that the unsalted butter was perfectly dry and the salted butter very wet, but in every instance the chemical analysis of these two samples of butter showed that the salted butter contained very much less water than the unsalted. On an average of about thirty determinations there was a difference of about four per cent. in the amount of water in the salted butter as compared with the unsalted. The salted butter every time contained less water than the unsalted. That was such a contradiction to the appearance of the butter, that we tried to figure out some explanation for it, and the best we could get at was that the fat of which the butter was composed will mix with water, and that the globules of water that are mixed with the fat, are so small that you cannot see them. They won't separate very much, and as soon as you add salt to the butter the brine is made. The attraction of the brine and fat is so much different to the attraction of fat and water, that the salt or brine accumulates. In the unsalted butter it does not accumulate. Salt is therefore one thing that influences the amount of water in butter. That is one of the clearest demonstrations we made in our creamery last year, that although the unsalted butter looks drier than the salted, it actually contains more water than the salted butter.

Another thing—we churned the butter to different sized granules of butter. We took it out of the churn, we stopped the churn when the granules were a little smaller than wheat, then we worked it in the worker a certain number of revolutions, and salted it, then took the package of that butter and analyzed. We also churned another churn of that same cream until the granules were about the size of corn grains, and we worked that butter in the same way and we found in every case that in the butter with the larger granules, the finished product contained more water than the butter that was churned to very small granules. You see that in working the butter it passes between the rolls of the worker, and that if the butter is in very small granules it forces out the water much faster than it does if the granules are larger as the water is held in the midst of these granules. These are two points that influence the amount of water in the butter. It may be that the temperature at which the cream is churned has also something to do with

the amount of butter, but we have not carried on any experiments yet to satisfy us as to what the difference is. If anyone else has had any experience in that line, I wish they would mention it.

PROF. DEAN : As to the size of the granules, that is different to our experience.

PROF. FARRINGTON : When scientists don't agree I do not know who can agree. Have you published the results of that experiment ?

PROF. DEAN : Yes you will find them in our last annual report, for 1898.

PROF. FARRINGTON : You will find my report in our last annual report for 1899.

PROF DEAN : It does not follow that because we have results different from Prof. Farrington, that we will always have them. So far as our experiments went, the smaller the granules the larger the amount of moisture the butter contains.

PROF. FARRINGTON : It seems to me as natural, if you churn the butter till the granules are the size of your fist, that in working if you cannot squeeze nearly as much out as you could if the granules were the size of wheat grains. Our chemical analysis substantiate our theory.

PROF DEAN : There is to my mind little or no attraction between fat or grease and water. They have no affinity one for the other. Now, water is held in the butter granules between the particles, the smaller the particles the greater the number of spaces and the greater the amount of space for water to accumulate.

PROF. FARRINGTON : Yes, and if you have a greater number of spaces, and the water is divided into larger globules, it seems to me you squeeze the globules out much faster by the same amount of working that you would if it were one large lump.

MISS ROSE : I think I agree with Prof. Farrington. I find when the butter has been to much gathered it is harder to expel the moisture than when it is gathered in small granules.

PROF. FARRINGTON : I thank you very much. I am always glad to have the ladies on my side. Still I shall be very much pleased to repeat the experiment and get further information on this point.

A MEMBER : When butter comes from the churn in very small granules there is a large amount of water removed from that butter when it is being worked, and I think that all butter makers have noticed this, that when the butter is gathered in large lumps there is very little water expelled from it.

MISS ROSE : I am not speaking of the amount of water that comes off from the worker, but the amount of water that is retained in the butter after the working.

PROF. DEAN : I can agree with Prof. Farrington, that you cannot judge of the amount of moisture in the butter by appearance only. You can only determine that by analysis.

PROF. FARRINGTON : I think the evidence is about evenly balanced, so I think we had better drop the subject unless some one wants to speak on my side. With regard to the temperature at which you wuuld heat milk or cream in pasteurizing. In competition with Danish butter which brings nearly the highest price in London, I believe some butter from the North of France, Normandy butter, brings the very highest price. Danish butter is made from pasteurized cream. The process is simply to heat it up to a certain temperature and hold it for a minute or so at that temperature, or for twenty minutes. Now, I presume that you have noticed that butter that has been made from pasteurized cream is very different from butter made from cream that is not pasteurized. Heating of the fat seems to change it in some way. No matter how you cool or work it afterwards, you still have a sort of smeary body.

PROF. DEAN : Not in this country.

PROF. FARRINGTON : I just came from St. Marys, where they have one of the best creameries in this country, and that is what they told me was the great difficulty they had to get over, the trouble of the smeary appearance. In addition to pasteurizing cream for the purpose of making butter it is always heated and pasteurized for the purpose of putting it into pint bottles for delivery to families. It will then keep for one or two weeks without souring, and they like to get the cream in that way for that reason. There is one objection to this cream, that is that the cream does not rise on the milk, and we find that by lowering the temperature from 155, which has always been adopted in the past as the proper temperature, down to 140 we preserve the the natural cream-rising qualities of the milk, and that I think is a point that is of a great deal of interest to

dealers who pasteurize their milk and deliver it to customers in any city or town. From experiments reported by Theobald Smith, it has been shown that the temperature of 140 was sufficient to kill the tuberculosis germ. Previous to that it was considered necessary to heat the milk up to 155 or 160, and that the hardest disease to kill was the tuberculosis. In our annual report for 1899 you will see the results of some experiments that show that the temperature which has been adopted in the past, 155, is not necessary, and that you can accomplish the same results at a temperature of 140.

Mr. Ballantyne : How long would you continue that experiment?

Prof. Farrington : About 15 minutes.

Prof. Dean : Have you had better results from heating up to 180 degrees? Is not that a Danish report that a temperature from 180 to 185 gives better butter than pasteurizing at 155?

Prof. Farrington : I know in Denmark, that they found by statistics, that 33 per cent. of the dairy cows have tuberculosis in some form or other. It is one of the highest records of sick cows in any country that I know of, so it may be they want to be sure to kill all these germs, before they make the milk or cream into butter.

Miss Rose : Is the melting point of butter the same in butter made from pasteurizing cream as butter made from ordinary cream?

Prof. Farrington : I cannot think of any chemical change that could be caused in the butter simply by heating the milk or the cream. At a test that was made every day at the World's Fair, from three breeds of cattle tested for six months, a sample of the butter was brought every day to the Chemical Laboratory, and we analyzed it. There was butter from thorough-bred Guernseys, thorough-bred Jerseys, and thorough-bred Short Horns. Milk from these cattle was taken to the dairy building, made into butter, each batch kept separately, and samples of these lots of butter taken the Laboratory and analyzed. The samples were not marked in any way except by a number on each. When these three samples came into the Laboratory, every one of us could pick out from the jar of butter the breed to which each jar belonged. The Jersey butter was always hard and firm and solid, and had a considerable higher melting point than the Guernsey butter or the Short Horn. Another peculiarity of these three breeds was the extremely yellow color of the Guernsey over that of either of the other breeds. The Jersey butter was considerably whiter, and it may be that the breed of cows causes the melting point of fats that are in the butter.

Miss Rose : Do you know of any other way of overcoming the difficulty of cream churning, except that of raising the temperature? We had some cream, and it was only after we raised the temperature over 70 that we could get butter at all.

Prof. Farrington : Do you know how rich that cream was?

Miss Rose : About twenty per cent.

Prof. Farrington : If I had such cream as that in a churn, I should try to run it through a separator and make it thicker. You can churn thick cream at a temperature that does not give soft butter.

Miss Rose : The difficulty was this : We churned it at 72, washed at 56 or 58, and the same day I had churning at 56, and the butter I had churned at 72, was just as firm as the butter churned at 56.

Prof. Farrington : Was the same lot of cream divided?

Miss Rose : No, altogether different cream ; 15 degrees difference in the churning temperature, yet one butter was as firm as the other.

Prof. Farrington : Was there not a difference in the thickness of the cream?

Miss Rose : No.

Prof. Farrington : It must have been due to the breed of cattle, or the feed.

Miss Rose : They were Jersey cows.

Prof. Farrington : The Jersey butter was always harder than either of the other two lots.

Miss Rose : The butter had a very crumbly appearance. I could hardly work it sufficiently to get it knit nice.

Prof. Farrington : I think those two lots of cream must have come from two different breeds of cattle or from two farms at which there had been a different method of feeding.

Mr. SMITH : Would not the fact that the cream churned at a higher temperature, and washed at a lower temperature, have a tendency to make it firm in body?

PROF. FARRINGTON : That is a point I want to investigate in the future, to see what influence the temperature and churning have upon the amount of water in the butter.

Mr. SMITH : We are carrying on an experiment in the Western Dairy School at Strathroy, to discover whether it is more beneficial to pasteurize the whole milk or the cream. I have a cream pasteurizer in now. We are going to make a number of experiments on both methods.

PROF. FARRINGTON : You know of course that 95 per cent, of the pasteurized butter made in Denmark is made by pasteurizing the milk instead of the cream.

Mr. SMITH : Do you not think that by developing a little more acid in pasteurizing cream you could overcome that mild flavor, that we could get any flavor we desired? Why would it not be just as easy to develop a sufficient amount of lactic acid in pasteurized cream provided you used the same starter?

Prof. FARRINGTON : I think you can. That is one way in which you can get a uniformly high flavor if you wanted it; but the London market does not want butter with a high flavor, they want this mild flavor that you get from pasteurized cream.

Mr. STEINHOFF : I met with a considerable quantity of butter last year that had too much moisture. What would you say was the fault, or what would be a remedy?

Prof. FARRINGTON : According to my experience, if I wanted to diminish the amount of water in the butter I would churn it to small granules and add a large quantity of salt. According to Prof. Dean you could churn it to large granules.

Mr. BALLANTYNE : Suppose you didn't want a large quantity of salt?

Prof. FARRINGTON : Then I would churn it to large granules.

Mr. STEINHOFF : Would you recommend working twice?

Prof. FARRINGTON : Yes, sir, I am sure I would. I think it is always beneficial to to work butter twice, especially if you used the combined churner and worker. You could get a more even distribution of the salt.

Mr. SMITH : Do you think, if the butter-maker thoroughly understands the working of butter, and if he can tell when it is worked sufficiently, that it is necessary to work it twice?

PROF. FARRINGTON : I think he could tell if he is an expert.

Mr. SMITH : Don't you think he should be expert enough to do that?

PROF. FARRINGTON : No, I do not think it is necessary.

Mr. SMITH : I think every butter-maker should know how to work butter properly, and I think it is a very simple matter to learn.

Mr. STEINHOFF : Do you say that working butter is a good way to get the water out?

Mr. SMITH : I would advocate churning the butter at the right temperature. It has been my experience that granules that are very fine retain too much moisture.

PROF. FARRINGTON : My method of giving butter two workings is about like this; you stop the churn and draw off the buttermilk, throw in your salt and give it about half a minute of working; then you let it lie in the churn for half an hour to an hour, and then you give it a second working right there. That is when I do the second working. I think it is much better than to complete the working at the start.

Mr. SMITH : I may say that it is a very good system, and a very good suggestion indeed.

Mr. FARRINGTON : That is what I mean by two workings.

Mr. SMITH : What we understand by two workings here is to take the butter from the churn into a cooler room, and bring it back again to give it the second working.

Mr. DERBYSHIRE : Then you think most of the butter to-day is overworked?

Mr. SMITH : I think it is.

PROF. FARRINGTON : I think the cause of mottles in butter is the salt. If you take that butter right off without stopping you will finish your work before the salt is thoroughly dissolved, and so you will be more liable to have mottles in the butter than you would if you worked it for awhile and then let it stand for half an hour before working it again.

Mr. SMITH : Don't you find a very great difference in the quality of the salt? Some salts dissolve more quickly than others.

PROF. FARRINGTON : There is as much difference in the size of the granules of salt, as there is in powdered sugar and granulated sugar. The salt that is the finest will dissolve the most quickly.

Mr. STEINHOFF : I think the matter of moisture is an important one. Mr. Smith speaks as if it were a matter of the butter being worked enough. Where I found excessive moisture, I do not think that was the cause. I think there must be something in the temperature of the churning.

Mr. BALLANTYNE : I think you can remedy that difficulty by regulating the amount of salt you have in the butter. You will find that in excessively salted butter the brine will drop off much more quickly than in butter that has not been salted to such an extent.

A MEMBER : It is always a good thing to recommend working the butter a little more when you find too much moisture. Excessive moisture in the butter as it comes on the butter-worker is due to two causes. 1st, the granules of the butter are too smalls, and 2nd, the butter has not had sufficient time to drain. What has been you experience with regard to the yield of butter from pasteurized and unpasteurized milk? Have you found pasteurized milk to yield the same amount of butter as unpasteurized?

PROF. FARRINGTON : True, there is a slight difference in favor of the unpasteurized butter. You get a larger yield from raw cream than you do from pasteurized cream. You never can churn pasteurized cream at as low a temperature as you can raw cream. If you churn raw cream at a low temperature you get a more exhaustive churning.

Mr. RODGERS : I have found that the yield of butter from pasteurized cream was less than that from raw cream.

COMMITTEE ON RESOLUTIONS.

Moved by HAROLD EAGLE, seconded by D. DERBYSHIRE,—

That this Association memorialize the Ontario Government to make a grant to the Industrial Exhibition Association of Toronto towards the erection of a new dairy building on the Toronto Exhibition grounds during the present year.—Carried.

Moved by ROBERT JOHNSTON, seconded by I. W. STEINHOFF,—

That this Association, realizing the vast importance of good roads to the country generally, and especially to the dairying interest, is of the opinion that this improvement can be brought about in a more perfect and economical way by placing the main roads of the counties in the jurisdiction of the County Councils; and would recommend that the Legislature be asked to take such steps as may be deemed advisable to bring about this change.—Carried.

Moved by J. N. PAGET, seconded by A. F. MACLAREN, M.P.,—

Whereas the building wherein the exhibition of cheese and butter and dairy utensils at the Industrial Fair is held is altogether unsuitable, both from its position and construction, in which to display the the exhibits of cheese and butter and of utensils used in the manufacture of cheese and butter, or for the convenience of the public to inspect the exhibit; and

Whereas the method of making the entries and of receiving the exhibits is faulty, causing much confusion in the arrangements of the exhibits in the building, and making it most difficult for the judges to satisfactorily do their work.

Therefore be it resolved, that this Association would request the Directors of the Industrial Fair Association, to appoint a committee to confer with a committee to be appointed by the Board of Directors of this Association, with a view to making more perfect arrangements for the management of the Dairy exhibit.—Carried.

Moved by HAROLD EAGLE, seconded by R. M. BALLANTYNE,—

That the sympathy of this Association be tendered to Mr. J. A. James, of Nilestown, for many years a member and director of this Association, on account of his serious illness, and the Association express their hope that he will be speedily restored to health. —Carried.

REPORT OF NOMINATING COMMITTEE.

Officers for 1900.

Honorary President,	Hon. Thos. Ballantyne, Stratford.
Honorary Vice-President,	John Prain, Esq., Harriston.
President,	R. M. Ballantyne, Stratford.
1st Vice-President,	A. Wenger, Ayton.
2nd Vice-President,	Jas. Connolly, Porter's Hill.
3rd Vice-President,	J. N. Paget, Canboro.

Directors.

District No. 10,	Geo. H Barr, Sebringville.
District No. 13,	Geo. B. Goodhand, Milverton.
District No. 9,	Robt. Johnston, Bright.
District No. 11,	A. F. MacLaren, Stratford.
District No. 7,	M. Morrison, Harriston.
District No. 12,	John Brodie, Mapleton.
District No. 8,	Harold Eagle, Attercliffe Station.

Auditors.

J. C. Hegler, - Ingersoll. J. A. Nelles, - London.

Representatives to Industrial Exhibition, Toronto.—H. Eagle, R. M. Ballantyne.

Representatives to Western Fair.—T. B. Millar, London ; I. W. Steinhoff, Stratford.

In consideration of the fact that the interests and objects aimed at by the Cheese and Butter Makers' Association are identical with the objects of this Association, we beg to recommend that representatives be appointed by this Association to meet with representatives from the Cheese and Butter Maker's Association for the purpose of discussing the advisability of the union of the two Associations.

Jas. A. Gray, Chairman.

I. W. Steinhoff, Secretary.

On motion adopted.

Mr. R. M. Ballantyne, President-elect, then took the chair. A vote of thanks was moved to the retiring president which was carried with much enthusiasm.

Mr. Eagle : There are some things I can do, but one of the hardest things I have always had is to reply to a vote of thanks. It is an easy matter for the President of the Association to go out of the chair and then drop out of the work. I want to thank Mr. A. F. MacLaren for the very kind way in which he has helped me through all the sessions since I went into the chair. Messrs. A. F. MacLaren and R. M. Ballantyne have been responsible for whatever I have done, for if one did not pick at me on one side the other one would ; and I want to tender them my hearty thanks for their always ready help. I thank you also most kindly for your vote of thanks. I trust to meet you all next year at our 34th annual meeting, and hope that in the meantime you will put forth every effort to advance the interests of the butter and cheese industry of the Dominion of Canada. Let us see to-day that no stone is left unturned to make Canadian butter and cheese the best in the world. We can do it only by putting a right shoulder forward, and by everyone working heartily together.

DAIRY SCHOOLS OF ONTARIO.

During the winter of 1899-1900 three dairy schools, supported by the Ontario Government, were conducted in the Province—at Guelph, Strathroy and Kingston—all of them being under the direction of Dr. James Mills, President of the Ontario Agricultural College. The courses of instruction were largely the same in each case, although the Central School at Guelph had the benefit of a series of lectures from members of the College staff, and also the advantage of practically judging and handling dairy cows and studying dairy breeds. The courses pursued were practically as follows :

In order to meet the growing demand for good butter-makers to take charge of factories during the winter months and early spring, each dairy school was open from December 4th to the 22nd.

A practical and thorough training was given in the running of cream separators of different makes, the pasteurization of whole milk and cream, care and ripening of pasteurized and raw cream, use of the acid test for cream, running of box churns, the combined churn and worker and the Mason worker, the preparation of butter for local and export markets, and other work of a practical character ; also in testing the milk with the Babcock tester and lactometer, in the use of the oil test churn, in composite sampling, and in the making up of factory accounts, so that the students might have a thorough knowledge of how to run a creamery properly. There were no examinations and no certificates given in this special course.

There were two factory courses, one of three weeks and another of six weeks' duration. These courses provide theoretical and practical instruction in cheese-making and the curing of cheese, butter-making (both separator and cream-gathering plans) and preparation of butter for market, milk testing with the Babcock tester and lactometer, and oil-test churn, which is so much used in cream-gathering creameries ; pasteurizing both whole milk and cream. They also included fermentation tests, the use of starters, dairy bacteriology, agriculture in relation to dairying, and factory records and accounts, etc.

Discussions on practical dairy topics, led by one of the instructors, was held four afternoons in each week. These discussions lasted for one hour and were of much value to both students and instructors. Experts were brought to the schools from time to time to give lessons in the judging of cheese and butter.

Special instructions were also given on the care and running of boilers and engines by a competent instructor. There was also practice in pipe-fitting, repairing valves, etc.

While the fact is recognized that the manufacture of cheese and butter must be confined largely to the co-operative or factory system in order to attain the highest success, it is also a fact that a large quantity of butter and some cheese are made, and will continue to be made, in farm dairies. To enable the farmers to produce a finer quality of butter and cheese, and thereby receive a better price, a home dairy course was carried on in two of the schools. A competent lady instructor was secured in each case, and the methods followed, and the apparatus and utensils used were inexpensive, and such as have been found most suitable for use in farm dairies. Students for this course were allowed to enter any time after January 4th and remain as long as they wished.

At each of the schools a library of carefully selected books, including the latest works on dairying and kindred subjects, together with the leading agricultural journals, is kept for the use of the students.

AGRICULTURAL COLLEGE DAIRY SCHOOL.

H. H. DEAN, B.S.A. .... Professor of Dairy Husbandry.
JAMES MORRISON, R. W. STRATTON .... Instructors in Cheese-Making.
MARK SPRAGUE .... Instructor in Separators and Piping.
JAMES STONEHOUSE .... Instructor in Butter-making.
JAS A. MCFEETER .... Instructor in Milk Testing.
MISS LAURA ROSE .... Instructress in Butter-making in Home Dairy.
THEO. WIANCKO .. Instructor in Separators and Milk Testing in Home Dairy.

The years 1899 and 1900 have been successful ones at the Dairy School. The attendance has been good, the interest keen, and the work helpful to cheese and butter makers and to farm dairymen, including farmers daughters and wives.

During the sessions of the past two years there have registered for the various dairy courses, 209 students. This number does not include the regular College students who have also taken considerable practical dairy work in addition to the lectures given on dairying. Of the 209 registered, 45 were ladies, or over 21 per cent.

By counties, cities and districts in Ontario, and from other provinces and countries the attendance was as follows: Algoma 2, Brant 5, Bruce 11, Durham 6, Dundas 2, Dufferin 3, Elgin 5, Essex 1, Grey 6, Grenville 2, Hastings 5, Haldimand 1, Halton 5, Hamilton 1, Huron 5, Kent 1, Lambton 2, Lanark 2, Leeds 1, Lennox 1, Lincoln 2, Manitoulin Island 1, Middlesex 8, Muskoka 2, Norfolk 3, Northumberland 1, Ontario 5, Oxford 5, Perth 8, Peterboro 3, Peel 1, Prescott 2, Renfrew 1, Simcoe 5, St. Joseph's Island 1, Toronto 11, Victoria 2, Waterloo 6, Welland 2, Wellington 48, Wentworth 8, York 6; British Columbia 2, Manitoba 1, North West Territories 1, Quebec 2, Indiana, U. S. A. 1, Pennsylvania, U. S. A. 1, Scotland 1, England 1, Sweden 1.

The previous experience of students varied from none at all to 21 years. Several students have had experience ranging from 5 to 15 years. Most of our Home Dairy class have had some experience in farm dairy work. All students who purpose taking the factory courses should have some knowledge of the conditions existing in cheese factories and creameries in order that they may receive the full benefits.

These courses include instruction in the making and curing of cheese; the running of power cream separators; operating churns and workers, of which two are combined churns and workers, and preparation of butter for local and export markets; testing milk with lactometer, Babcock and Lister-Gerber testers, and also in the use of the oil-test churn and chart.

Previous experience is not necessary for the Home Dairy work. Here the conditions are such as would be met in a good dairy on a well-equipped farm, except that five hand separators of different makes are in use that students may judge of their respective merits. In addition to the practical work along the line of making good butter and cheese, students are drilled in judging dairy goods so that they may know a good article when they produce it.

Lectures by the Professor of Dairy Husbandry and members of the College staff broaden the views of students. Animals from the dairy stable illustrate the form and characteristics of a good dairy cow, and the special characteristics of the dairy breeds.

The Literary Society is a means whereby students become acquainted with the rules of debate, and wear off the timidity which many have at hearing the sound of their voice on a public platform.

From the brief outline given, readers may judge that the course, for a three months session, is a somewhat comprehensive one, and tends to make better cheese and butter makers as well as better citizens.

The makers who attended the sessions of the Dairy Schools in their beginning are apt to get behind the times unless something is done to draw them from the narrowness of their own factories and surroundings. There are many in factories who understand the making of cheese and butter, but who would be improved by a few lessons on more scientific lines than they can obtain in factories or at the Dairy Schools as now conducted. A course of instruction in laboratory work, relative to Dairy Bacteriology and Dairy Chemistry is needed for these men. This course should not be too technical, and should

extend over not more than two weeks or a month's time. If this were combined with a course in experimental cheese and butter work it would be very helpful. For instance, in the Bacteriological laboratory a student might learn the nature of gas-producing organisms, then he might take a culture of these germs to the cheese room and observe their effect on milk for cheesemaking. Under a trained experimenter he could study the best methods of preventing and overcoming these gassy taints.

In the butter department a student might treat butter in different ways to see the effects on the moisture retained by the butter. He could then take this butter to the laboratory and determine its moisture. This would be a very important lesson to him. It is not supposed that factorymen will become trained chemists or bacteriologists in two weeks or a month, but under proper instruction they might obtain many valuable lessons which would help them in their everyday work and also make life more pleasant.

The advances in dairying demand that our Dairy Schools shall keep abreast of the times. Much of the instruction now given could be as well given at ordinary cheese factories and creameries at less expense than at a Dairy School. Dairy Schools should take up work which cannot be undertaken in the ordinary routine of factory work. The very best man should be employed to give the instruction needed. Men who are miles away from the conditions found at creameries and cheese factories, are not wanted. But men who have been trained scientifically and who at the same time can get on a level with ordinary men, and know their needs can do much more good to the dairymen. How shall we best meet the needs of dairymen during the first quarter of the twentieth century ? is a question for the managers of all Dairy Schools to ask. Having asked the question a satisfactory answer should be sought after and the policy of the schools ought to be shaped so as to meet these needs of the great and growing dairy industry of Canada.

H. H. Dean,
Superintendent.

Guelph, March 1st, 1900.

EASTERN DAIRY SCHOOL.

J. W. Hart ....Supt. and Instructor in Cream-Separating.
G. G. Publow ....Instructor in Cheese-Making.
W. M. Singleton ....Assistant in Cheese-Making.
L. A. Zufelt ....Instructor in Milk-Testing.
W. A. Wilson.....................Instructor in Butter-Making.
J. Buro..............................Assistant in Butter-Making.
Jas. Noble ....Engineer.
W. T. Connell, M.D ....Bacteriologist.

I have the honor to submit the following brief report of the operations of the Kingston Dairy School covering the year 1899, and of the current year to date.

Number of students registered during the year 1899, 111. Number of students registered in 1900, 36. In the Special or Long Course of 1899, there were 20 students taking cheese-making, and 28 butter-making. In the examinations (sessions of 1898-99) for the Dairy School Certificate in butter-making 12 students wrote, of whom 8 succeeded in passing. Out of 12 who wrote on cheese-making, 8 passed all the examinations. Six of the latter, having fulfilled all the conditions, have been granted certificates.

The sixth session of the school opened on the 4th of December, 1899, with 8 students in butter-making and 8 in the cheese-making departments. In the second course there were 25 students. In the third or long course, 47 students registered, 29 of whom were in the cheese-making department, while the remainder were given instruction in butter-making.

The applications received to date (session of 1899-1900) number 104. Number of students in attendance to date (session of 1899-1900) 75.

During the session milk for the needs of the school was supplied by 76 patrons. In all 903,142 lbs. of milk containing 35,669.75 lbs. of butter-fat were received, and from this 30,563.5 lbs. of butter and 18,888.5 lbs. of cheese were made. The total receipts from sales amount to $8,029.83 and $7,831.21 was paid to the patrons for milk, an average of 23.26 cents per lb. of fat, or 91.88 cents per hundred weight of milk.

During the summer the students who were working for certificates, were visited, and visits were paid to a large number of cheese-factories and creameries. Visits were also paid to the Dairy Schools at Guelph and St. Hyacinthe. The Superintendent of the School acted as judge at the Agricultural Exhibitions at Toronto, Ottawa and Kingston.

Experiments were carried on during the summer in the curing of cheese at different temperatures. On account of the cool weather prevailing during the summer, comparisons between curing cheese in the curing-room where no attempt was made to control the temperature, and in the rooms where the ice and sub-earth duct were used, were not so striking as they would have been had the weather been hot. The results of the experiments on the whole, corroborated those made in previous years, which indicate that the average temperature prevailing in our factories during the summer months is too high, and that a better quality of cheese with less shrinkage would follow if the curing-rooms were kept at a lower temperature.

Another important point to which little attention has been paid is that more moisture can be retained in the cheese where it is intended to cure at a temperature of 60 or 65 degrees. Where more moisture is retained in the cheese, more cheese can be made from each hundred lbs. of milk. The cheese will be softer and will cut much better than the hard dry cheese necessarily made where the curing-rooms cannot be kept cool.

It is proposed to carry on investigations at the school during the coming summer in the curing of cheese having different percentages of moisture.

J. W. HART,
Superintendent.

KINGSTON, March 1st, 1900.

WESTERN DAIRY SCHOOL.

ARCHIBALD SMITH.......Superintendent and Instructor in Milk Testing.
C. O. LUTON............Instructor in Cheese Making.
GEO. R. JOHNSTON........Instructor in Cream Separators and Butter Making.
Miss BELLA MILLER......Instructress in Home Dairy.
Prof. HARRISON..........Bacteriology.
Prof. DAY..............Agriculture in relation to Dairying.

The Western Dairy School was closed during the Summer of 1899.

I was engaged as Superintendent about Nov. 1st, 1899, and on Dec. 4th the School was opened for a special creamery course which ended on Dec. 22nd.

The cheese department, which had been done away with, was re-established, and a portion of the cheese department was partitioned off for a Home Dairy room, and a number of other changes were made in the equipment of the School.

On Jan. 4th, 1900, the school re-opened with a full staff of instructors in the several departments. About 4000 pounds of milk is received daily, and the cream from one skimming station.

There have been 29 students in attendance, and a thorough and practical training is given in the manufacture of cheese and butter by both factory and Home Dairy systems, the handling of cream separators, milk testing, care of boilers and engines, and Agriculture in relation to dairying, etc.

A new feature introduced this winter has been the holding of monthly meetings of the farmers and dairymen of this district at the Dairy School. Competent practical speakers are brought from a distance to deliver addresses on Agriculture and Dairying, etc., and to take part in the discussions which follow. These meetings have been well attended, and are much appreciated by the farmers who attend, as they serve to impart a great deal of useful information. This is one of the best methods I know of for educating the farmers in the production of a better quality of milk for our cheese and butter factories, and in improved methods of dairying. The school will close for this term on March 31st.

A number of experiments are being made in the manufacture of butter and cheese.

ARCH'D SMITH,
Superintendent.

STRATHROY, March 1st, 1900.

THIRTY-FIRST ANNUAL REPORT

OF THE

FRUIT-GROWERS' ASSOCIATION

OF

ONTARIO.

1899

(*PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO*).

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1900.

THIRTY-FIRST ANNUAL REPORT

OF THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

1899.

To the Honorable John Dryden, Minister of Agriculture:

SIR,—I have the honor to submit for your approval the Thirty-First Annual Report of the Fruit Growers' Association of Ontario. The discussions therein contained are upon matters of great importance to the Fruit Growers of our Province, such as the best export markets and the best and most economical methods of transportation.

I am, Sir,

Your obedient servant,

L. WOOLVERTON,

Secretary.

GRIMSBY, January, 1900.

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

OFFICERS FOR 1900.

President..... ....W. M. ORR, Fruitland. Ont.
Vice-President ....G. C. CASTON, Craighurst, Ont.
Secretary-Treasurer and Editor of the Canadian Horticulturist..LINUS WOOLVERTON, M.A., Grimsby, Ont.

Directors.

District No. 1	W. A. WHITNEY, Iroquois.
" 2	R. B. WHYTE, Ottawa.
" 3	HAROLD JONES, Maitland.
" 4	W. BOULTER, Picton.
" 5	THOMAS BEALL, Lindsay.
" 6	ELMER LICK, Whitby.
" 7	MURRAY Pettit, Winona.
" 8	A. M. SMITH, St. Catharines.
" 9	J. S. SCARFF, Woodstock.
" 10	J. I. GRAHAM, Vandeleur.
" 11	T. H. RACE, Mitchell.
" 12	ALEXANDER MCNEILL, Walkerville.
" 13	C. L. STEPHENS, Orillia.

Auditors.

A. H. PETTIT.......... .... Grimsby. GEORGE E. FISHER..............Freeman.

COMMITTEES.

Executive:

PRESIDENT. VICE-PRESIDENT. SECRETARY.

Finance:

W. M. ORR. M. PETTIT. A. M. SMITH.

Board of Control Fruit Experiment Stations:

W. M. ORR. W. BOULTER. A. M. SMITH.
LINUS WOOLVERTON (*ex officio*).

Fruit Exhibit:

PROF. MACOUN. W. H. DEMPSEY. E. MORRIS.
C. W. VANDUZER.

Resolutions:

THOS. BEALL. A. H. PETTIT. W. A. WHITNEY.

Grading and Inspection of Fruit:

A. H. PETTIT. E. D. SMITH. GEO. E. FISHER.
G. C. CASTON. MURRAY PETTIT. T. H. P. CARPENTER.

San Jose Scale:

M. PETTIT. W. M. ORR. ROBT. THOMPSON.
GEORGE E. FISHER. JOSEPH TWEEDLE. E. D. SMITH,
E. MORRIS. W. H. BUNTING.

Codling Moth:

JOSEPH TWEEDLE. E. D. SMITH. W. M. ORR.
A. H. PETTIT.

Transportation:

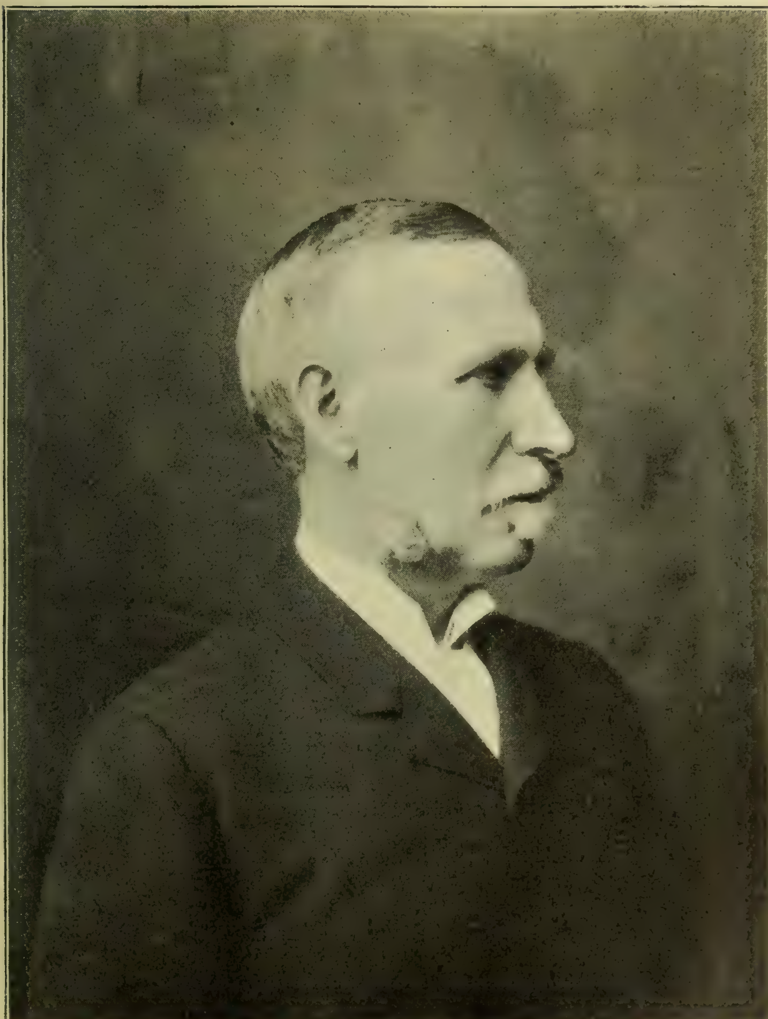
W. H. BUNTING. A. H. PETTIT. E. D. SMITH.
T. H. P. CARPENTER.

Good Roads:

ELMER LICK. G. C. CASTON. H. JONES.

New Fruits:

PROF. H. L. HUTT, O.A.C. Guelph. PROF. W. T. MACOUN, Central Experimental Farm, Ottawa.
LINUS WOOLVERTON, Grimsby.



MR. W. M. ORR, FRUITLAND.

PRESIDENT OF FRUIT GROWERS' ASSOCIATION, 1900.

Packing Apples for Export, in the Orchard of Mr. Pay, St. Catharines, Ont.

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FRUIT GROWERS' ASSOCIATION OF ONTARIO.

ANNUAL MEETING.

The thirty-first annual convention of this Association opened at Whitby on December 5th, 1899.

W. M. ORR, Vice President, said: Gentlemen,— In the absence of our efficient President, Mr. Wellington, who is in Europe, it becomes my duty to take the chair and call this meeting to order. I am glad to see so many directors present with us, but very sorry indeed that we miss some old familiar faces, unfortunately through sickness. You will see by the programme there is very important business to come before us. The question of the San Jose scale, the fraudulent packing of apples, and many other topics of interest are on the programme. I am sure they will have your very best consideration. I will ask the Secretary to read some correspondence.

Secretary WOOLVERTON: In addition to the letters that were read last night at the meeting of the Board of Directors explaining the absence of some of our directors—Mr. T. H. Race, of Mitchell, A. M. Smith, of St. Catharines, and two or three others who could not come on account of illness, I have also a letter from the Minister of Agriculture for the Dominion in response to a resolution that was passed by this Association a year ago asking that Mr. Orr be added to the staff of representatives at the Paris Exposition to assist in seeing after the interests of Canadian fruit growers. I have also a letter from Auguste Dupuis regarding fruit for the Paris Exposition. I have a letter from W. W. Dunlop, Secretary of the Montreal Horticultural Society, and one from A. McD. Allan, regretting his inability to attend this meeting of our Association.

Mr. POWELL, Ghent, was introduced and said: It certainly gives me pleasure to meet with you at this time and to bring greeting to you from the fruit growers of New York State. I feel that certainly we have a very common interest when we come to consider the extent and the magnitude of the work of horticulture, and I am always delighted to meet with those who are making horticulture their study and their life work. It represents to us I think the very best line of work. It represents to us I think the very highest of promise for the reason that it is attended by so many difficulties; and I find that any business that is attended by great difficulties calls out the very best that there is in men. You are not the men who give up to difficulties, but you meet them and are determined to solve them; and that is why I say that the future promises to fruit growers and to horticulturists so much, because of the determination to surmount difficulties. For that reason the future promises great in fruit culture, for the demand is for the finer and finer product continually. We all know from our own personal experience that when we go into the markets of the world to-day, or even into our home markets, there is a steady growing demand for a finer product; and that calls for special effort and for particular study on our part to overcome the difficulties of learning fruit culture in the control of injurious insects, in the control of all the fungus life that is making such inroads upon the value of our fruits; it calls for constant study and application of scientific knowledge and principle in our work in order to bring it to the highest standard of quality that is this day required. So it gives me very special pleasure to meet with this body to-day represented in your Association, because I know that you are men who are at the front in the study, and also are aiming at good practice in your work. It will certainly give me very much pleasure to meet with you through all the sessions of your meetings as far as time will possibly admit. (Applause.)

Committees.

The following Committees were then appointed :

Nominations : G. C. Caston and J. S. Scarff (by the President), and R. B. Whyte, W. H. Dempsey and R. L. Huggard (by the meeting.)

Fruit Exhibit : W. H. Dempsey, E. Morris and C. W. Van Duzer.

Resolutions : Thos. Beall, A. H. Pettit and W. A. Whitney.

HARDY FRUITS ALONG THE ST. LAWRENCE.

By W. A. Whitney, Iroquois.

It is well known that the vicinity of bodies of water is favorable to fruit production. For instance, the Niagara peninsula, situated as it is with Lakes Erie and Ontario and the Niagara River on three sides of it, is highly favorable to fruit raising, while places farther west in the same latitude are less favorable. The valley of the St. Lawrence, though lying farther north on both sides of the 45th parallel of latitude, is considerably tempered by the river, which has an average width of $1\frac{1}{2}$ miles and is open all winter for a great proportion of its length, owing to the swift current and rapids. An important point is that the water comes to us from the great lakes in a warmer region. The thermometer indicates a lower temperature a few miles inland than along the river banks. While orchards are very few in number and sickly in appearance in the northern concessions, almost every farmer near the St. Lawrence can and does raise a good orchard.

A good proportion of the soil is a gravelly loam, which proves favorable to fruit trees even without underdraining. And even on heavy clay soil I have seen trees still bearing which must have been 70 or 80 years old. It is claimed, and I believe justly so, that such fruits as we can raise along the St. Lawrence are superior in quality and in keeping properties to the same kinds raised in the West. The Snow apples grown on Montreal Island are the finest in the world.

Experience has taught our fruit growers to be content with but a few varieties. In the past, smooth-tongued tree agents, with their wonderful cuts of large fruits, succeeded in imposing upon the unwary. A rapid growth and an early death was the inevitable result. We are now content with the survival of the fittest in fruit. I think it advisable for the present to recommend only varieties of known hardiness and productiveness. Several of the newer varieties are giving great promise, but I dare not make any definite statements just yet as to their subsequent worth.

I would suggest the following varieties in the order named for productiveness and commercial value, viz.:—

Summer : Yellow Transparent, Duchess and Red Astracan.

Early Winter : Fameuse, Scarlet Pippin, McIntosh and Wealthy.

Late Winter : Scott's Winter, Salome, Seek-No-Further, American Russet, Yellow Belleflower, Ontario, Talman Sweet, Canada Red.

Perhaps I might include the Pewaukee and the Ben Davis, but I would prefer to wait till further testing.

The main dependence is on the Fameuse, or Snow. Its good qualities are its hardiness, its fine flavor, either for cooking or dessert, and commercial value. It does not fall easily by high winds. It is in good demand. But it dislikes a low, stiff soil. This objection is obviated by underdraining. Fully 80 per cent. of our apples are Fameuse.

The McIntosh originated in my own township—Matilda, in Dundas county. It is, with us, one of the hardiest kinds. Its large, luscious fruit leaves little to be

desired. It keeps far into the winter. But it drops badly before picking time, and no apple suffers worse from the black spot. Spraying, which is now fast growing to be a necessity in the St. Lawrence valley, will make the McIntosh an almost ideal apple.

The Duchess, as elsewhere, is perfectly hardy along the St. Lawrence. It is not largely cultivated, however, for it ripens too early and keeps so poorly that the market is soon glutted. It is too sour.

The Ontario has been fruited with us, and the tree gives promise of being hardy. It is hoped that another good winter sort may be added to our list, but it would be rash to plant largely till a further test is made.

The Pewaukee has won great favor so far at Lancaster.

The Scarlet Pippin is another promising apple. Fruit has been sold in Montreal this fall at $5 a barrel, and more wanted.

The Wealthy is very hardy, does not spot, and bears heavily, but, unless it is severely thinned, it drops its fruit, and the apples are small. Its flavor is not agreeable to all.

The Talman Sweet may be considered fairly hardy.

Other kinds are being tested, and some of them may prove worthy of finding a place in the half-hardy list. and perhaps in the hardy list. A few of the tender kinds are doing very well where they are top-grafted on selected native stocks.

Pears are not successful. The Flemish Beauty and Keiffer are tried more than any other varieties, and in sheltered spots will live to be well grown and will bear fine fruit.

It is not safe to plant the pear for commercial purposes. There may be possibilities in future from Russian varieties and other hybrids. Cherries do better than pears, but there are few planted.

Grapes of all kinds do well, but there must be careful protection in winter. The low price at which western grapes are sold forbids our raising them for market, owing to the expense of covering the vines well with earth in the fall. Last winter I failed to cover a part of my vines. The result was no fruit this year, but vigorous new shoots grew and I may have a crop next fall. Only the earliest maturing kinds are desirable, such as Concord, Worden, Delaware, Moore's Early, for fear of early frosts.

In strawberries our most satisfactory kinds are Crescent, Wilson, Manchester, New Dominion and Bubach. We have tried many kinds, but all have some lack, and some lack all good qualities. Although the same holds good of all fruit it is more especially applicable to strawberries, and that is that a variety that does well on one kind of soil may not do so well on a different kind of soil in the same vicinity.

Plums are a very uncertain crop. The trouble is not so much in the hardiness of the trees as in the thawing and freezing in March and April, which injures the blossom buds, and perhaps in the cold, east winds in spring. Our best kinds are Lombard, Saunders, Glass Seedling and Yellow Egg. The Ritson cannot stand our winters. Japanese plums are still in the experimental stage.

In Black Caps, Older and Conrath have both proved hardy without protection. Gregg is tender and Columbia does not seem quite up to the mark either in vigor or hardiness.

In raspberries the Cuthbert is mainly planted, but it suffers from frost at the tips.

In treating on fruits hardy along the St. Lawrence. I have tried to rely mainly on my own experience. It may differ from the experience of others in other parts of the St. Lawrence valley. It is not well to be arbitrary in our opinions, but to be open to conviction.

I would close by saying that I have just seen again the report of the Ontario Fruit Experiment Stations, and that I think it is very reliable.

Mr. E. MORRIS: Do you find the Scarlet Pippin as hardy and productive as the Fameuse and McIntosh Red?

Mr. WHITNEY: It is not as well tried as the others, but so far as we have tried it we find the tree very reliable. Mr. Harold Jones, who is present, is a better authority on that than I am.

The SECRETARY: Yes, he is the originator.

Mr. HAROLD JONES: I have four or five specimens of the apple at the hotel which I did not bring to the meeting. With regard to the character of the trees and fruit I might say that the tree is upright, perfectly hardy in root, branch and fruit. I have never suffered from winter injury at any time, and never failed to get a good crop. The tree is inclined to bear every other year, but with careful trimming we can get an annual crop. The season of the fruit is the same as the Snow. It is at its best during the latter end of November, and it is also good all through the month of December. The color I think is a brighter scarlet than either the Fameuse or the McIntosh Red, and it seems to take the eye quicker than either of those apples—I don't know why. Place the Fameuse and the McIntosh Red and the Scarlet Pippin all on the same market, and the Scarlet Pippin goes first and goes at good prices, and it seems to give excellent satisfaction where it has been taken in by private families. It is not free from fungus diseases, but it is not as subject to the scab as the Fameuse or the Snow. It is a chance seedling.

Mr G. Y. SMITH (Whitby): Is it sour?

Mr. JONES: It is mild sub-acid.

Prof. MACOUN (Ottawa): I brought some specimens of the Shiawassie Beauty with me. It is a great favorite with me. I have had it fruit at the farm three or four years. It is one of the most promising apples for family use. It is very much like the Fameuse, but larger, and the color is better with us at Ottawa, and the tree seems hardier, and altogether I think it is one of the most promising apples we have. It is a very heavy bearer, but bears every other year. We have them up to the middle of January.

The SECRETARY: Have you any difficulty about it dropping? I have found it inclined to drop.

Prof. MACOUN: Our experience was that it hung on the tree better than any other variety in the orchard. There was scarcely a windfall all summer.

Mr. MORRIS: Have you the Scarlet Pippin?

Prof. MACOUN: We have some young trees that have been in three years, and they are among the healthiest we have in the orchard.

Mr. JONES: I might say that the Ontario apple is decidedly in the experimental stage with us. I see Mr. Whitney says there is one orchard man who has taken to planting 200 trees in the spring. I am afraid I am the victim. I will plant 200 trees, but I am planting largely every year any way, and if I should experiment with 200 trees in a commercial orchard it might not be so great a loss to me as it would be to other people who just want to plant one orchard with good stock. Although I intend to plant 200 in the spring, I must say the Ontario apple is in an experimental stage as yet; its hardiness is not proved.

Mr. E. MORRIS: I want to warn fruit growers about one failing of the Ontario—that it dies in the top. If it were not for that it would be one of the best apples we have. I have heard it spoken of as one of the best exporters there is; in fact, when taken to England people will buy it for Northern Spy if not told the difference.

Mr. MACOUN: I would like to call attention to the Milwaukee, a comparatively new apple, fruiting for the first time in Ottawa this year. I think it will keep in good condition till the first of February, and I think it is a heavy bearer. It is a seedling of the Duchess. It is an acid apple.

The CHAIRMAN: I would like to ask Mr. Whitney how he would propose to

thin fruit in the blossom. I think that is one of the most important questions we have before us in regard to fruit growing. Our plum trees and many of our trees set two crops instead of one, and very often the tree is ruined by growing too heavy a crop. If we could control it in the blossom I think it would be a grand thing for fruit growers.

Mr. WHITNEY : I think it is not a very difficult matter with one pair of proper shears to go through the tree and clip out certain spaces just as little as of the twig as possible, just the blossom, and a man would go through a large number in a day. There is a great advantage in thinning the blossoms instead of the fruit, because if you let the fruit grow to the size of a walnut or hickory nut it so far exhausts the tree and exhausts the fruit buds that are then forming for the next season ; and it seems to me if it costs more to do it in the blossom that it would pay, because it would be less exhaustive to the tree. I think that would be a strong argument.

Mr. GRAHAM : Would it not be well to have extra pruning ? Has it not been stated that to produce a blossom was very hard upon the tree, even as bad as if it was killed by frost ?

Prof. MACOUN : The thinning would consist in killing the blossoms. You do not know beforehand what kind of a crop you are going to get. Sometimes flowers set very well, but you do not know how the fruit will turn out.

The CHAIRMAN : Very often the heavier the bloom the less the fruit.

Mr. PATTISON (Grimsby) : I have always understood that it was the ripening of the seed that was the strain on the tree.

Mr. CASTON : This was advocated both in the United States and here in our horticultural journals. Perhaps Mr. Powell can give us something.

Mr. POWELL : The question of thinning has been very carefully experimented in New York State, particularly at our experiment stations. So far the effort has been confined largely to thinning the fruit, and while the expense is considerable, yet in every experiment that has been tried it has proven to be an exceedingly profitable operation. When the fruit is set, then you have the entire control in your hands. You can detect much of the defective fruit, and with the same clippers or shears that you would prune the blossoms you can prune away the defective fruit and leave your finest fruit upon the tree. There, I think, would be the advantage in pruning away the fruit rather than the blossom The point that was made by the gentleman in relation to pruning is a good one. I think we fail very much indeed in sufficient pruning of our trees. By judiciously cutting out each year all the different varieties we can maintain a better uniformity all through the trees in the distribution of the fruit upon the tree. Now we are carrying too much wood. There is too much vitality expended in carrying wood upon our orchards. We could save by judicious pruning, thinning out, more properly cutting out, and thereby reducing the expense of thinning out, by a systematic judicious plan of cutting away the wood. I think one reason of our failure in plums is that they set altogether more than they can possibly carry. Now, if we would reduce perhaps from a quarter to a third of the wood in each of our plum trees we would save that very heavy drain on the trees, and we would get stronger, more vigorous, healthy trees that would carry a much finer quality of fruit. I think that the judicious pruning of the wood is one of the first and most valuable things to do. Then after that go through with the pruning shears and take out as far as possible all defective fruit. (Hear, hear).

Mr. TWEEDLE (Fruitland) : I agree very heartily with the remarks of Mr. Powell on that point. I believe that the great amount of surface at the time of the bloom requires a great deal of vitality to keep it in perfection and set its fruit ; and I think we have an old saying that the heavier the bloom the less fruit we have, and experience seems to bear that out in my case. Last year I

had an orchard of pears, a perfect sheet of white. We only got 40 baskets off 120 trees capable of bearing half a dozen baskets each tree. It seems to me it defeated itself, although we pruned it considerably. I think the pruning ought to be done earlier. If we cut off the bloom we are cutting off some of the vitality, as Mr. Powell has said. I recollect leaving some plum trees in the nursery till after the delivery season was over, and then we headed them back and the consequence was in the fall those trees did not weigh more than half what they did, and any person could go along and tell the difference in the weight as well as the growth. They were light and without sap. The late pruning had destroyed all the vitality of the trees. We had cut it off; it had gone. It was expended in the top of the tree, and to a great extent destroyed the whole growth. We want to do a large part of our pruning in the orchard early in the season. A great deal of pruning in our section is done by climbing up a ladder and getting around the inside of a tree and cutting out large branches and not cutting out the proper part of the tree. We do it by a different plan. We take our horse and rig, and with a platform we take our pruners and saws and get right out under the part of the tree that is bearing the apples, and thin out smaller branches, twigs, all through—thin out so that there is no branch nearer to its next neighbor than a foot or so. In that way we prune where we ought, and get the light and air through the bearing part of the tree. Then, I believe, in leaving the fruit in the crotch of the tree so that we don't have a lion's tail out on the branch. We might as well have our fruit distributed down the centre of the tree, and get a great deal more fruit without destroying the tree.

Geo. E. Fisher: I would be glad if Mr. Tweedle would give a date at which in his opinion apple trees should be cut.

Mr. Tweedle; I would prune about the latter part of March or the first of April in our section in order to get the best results.

Mr. Morris: I think a full session could be devoted to this subject. I differ from the last speaker as to the time of pruning. About the first of August the growth of the tree is about at a standstill; you thin it then and you have more fruit-buds, and more healthy buds. I would not thin out the big branches, and make long slender branches with an open centre, as I have often seen people do. A year ago I saw a full orchard destroyed by a man who knew nothing about pruning. He sawed out the large limbs through the top of the tree, left them all open, with the result that the sun came and struck the tops of those large limbs and killed half of them, and I believe almost destroyed that orchard for good. My plan of pruning, instead of taking out those large limbs, would be to cut them back on the outside. Keep your trees more compact, and run them up if you will, but do not let them spread out in long limbs and leave the sun get down to your big limbs on the inside. Even if it does not kill the bark right through, it has a tendency to stop the free flow of sap, and injures the tree very much. I remember some years ago that I read in the *Horticulturist* that May and June was the proper time to prune trees. I will just state that you cannot put a ladder or step on a limb in the month of June but what you are loosing the bark and causing a dead spot right there. It is all right if you can do it from the ground, but you must not step or put anything against a limb at that season of the year.

Mr. Whitney: I think the whole matter hinges on when the fruit-buds are formed. I think they are formed about the time the green buds begin to start.

Mr. Jones: I have tried to watch the development of the fruit-bud of the apple the last three or four years as carefully as possible, and as nearly as I can follow it, it commences to be built up shortly after the foliage unfolds in the spring. In our district that is about the first week in May; and I find that by the 20th or 25th June, or 1st July, that the fruit-bud for the next year seems to be fully built up in all its parts. But then if you take the bud and roll it in your

thumb it will roll right out; it is full of sap. It is fully built up, but is not ripened at all, and it seems that from the 1st July until the middle of September that the bud is ripening and drying out and getting hard and firm, getting free of sap so as to withstand the frost of the coming winter. If you take a bud off a tree now you will find it is quite hard, and it you rub it between your fingers it will roll—you can't crush it down, and it is quite dry, you could cut it in two with a knife and then roll it out. I think I am correct in my observation, but I have had no one to help me in the matter.

The CHAIRMAN: This matter is very interesting, and I would like to hear another half hour's discussion, but time forbids. I would like to say that in regard to grapes growing on the St. Lawrence Mr. Whitney missed a grape that probably would suit him better than any others, that is the Worden.

Mr. WHITNEY: I have the Worden, but really forgot to mention it.

Mr. CASTON: Is it ten days earlier?

The CHAIRMAN: Yes, I think every grower here would bear me out in that and it is a very good grape.

PEARS FOR THE PROFESSIONAL AND AMATEUR GROWER.

BY E. C. BEMAN, NEWCASTLE.

Pears adapted to the use of the professional and amateur grower, call for entirely different qualities. The professional grower is growing for profit, and the varieties must be adapted to that purpose. The tree must be a fairly good grower, sufficiently hardy and healthy to endure the climate and also productive. The fruit should be of good and uniform size, fine showy appearance, and of fairly good quality. It is also advisable to select varieties that are not subject to spotting or scab and other diseases.

On the other hand, the amateur grower wants, first of all, superior quality and handsome appearance, size is not usually taken into consideration. Of course if you can have all the other good qualities, of large size, beautiful fruit, hardy, healthy, productive and early bearing trees, you are that much better off, but you want quality first and last.

In this paper I shall not give any details regarding the planting, cultivation, or management of the orchard, but confine myself to a short discription of the most valuable varieties suitable for each class that have proved successful in my own orchard, and that are adapted to this part of the Province of Ontario.

There is one thing to be taken into consideration in selecting varieties for planting, and that is the variation in quality on different soils and situations. A variety may succeed on one farm and be a failure on the adjoining farm, and consequently it is not advisable to plant largely of any variety until you have tested them on your own soil or know them to succeed on adjoining land and under similar conditions. The only sure way is to test for yourself, but unfortunately it takes nearly a life time before one can fully decide what to plant.

In the following descriptions I have placed each class in their order of ripening:

MARKET VARIETIES.

Clapp's Favorite.—Tree, an upright, vigorous grower, becoming spreading when it commences to bear; shoots require shortening back when young, or branches will become too long to make a good top; hardy, but subject to blight; very productive. Fruit, large and uniform in size, and evenly distributed; obovate ovate pyriform, pale greenish yellow, with dull crimson cheek, becoming

a lively red as it ripens up. Flesh, exceedingly juicy, fine grained, with a very agreeable slightly acidulous flavor. Season, first of September. A very good market fruit, but must be picked as soon as full grown and before fully colored, or it will rot at the core.

Bartlett.—Tree, an upright, but not very vigorous grower; healthy, but not very hardy; succeeds best when top grafted on some hardy, strong growing stock; exceedingly productive, in fact is almost an annual bearer; requires heavy manuring. Fruit, large obtuse pyriform, clear pale yellow, occasionally a pale blush on the exposed side. Flesh, very juicy, fine grained, melting; sweet, with a rather peculiar musky, agreeable flavor, fine for both dessert and canning. Season, first to middle of September. One of the best pears for home market, and fine for export if picked early and properly handled.

Duchesse Precoce.—Tree, an upright grower, healthy, fairly hardy, exceedingly productive; commencing to bear very young, consequently the trees do not grow large, and will probably be short lived. Fruit, resembles Bartlett in size and color, but slightly longer in form. Flesh, juicy, melting, with a slightly acid flavor, not of the best quality for dessert, but very fine for preserving. Season, a week later than Bartlett. A comparatively new variety, originated in France. Although not very high in quality, yet on account of its fine appearance and enormous productiveness it makes a very profitable market fruit.

Boussock.—Tree, a vigorous, spreading grower, healthy and hardy; moderately productive, but not an early bearer. Fruit, large, roundish obovate, deep yellow and russet, with a warm red cheek. Flesh, juicy, melting, sweet, agreeable flavor. Season, end of September. A very showy fruit, but not quite productive enough to make a first-class market fruit.

Howell.—Tree, an upright grower, healthy, moderately hardy, productive and an early bearer. Fruit, large, obovate pyriform, pale yellow, occasionally shaded with red. Flesh, juicy, melting, pleasant, slightly acid flavor. Season, first of October. A very good market fruit.

Goo ale.—Tree, a vigorous, thrifty, upright grower, healthy, hardy and productive. Fruit, large, oblong obovate, greenish yellow, shaded with reddish brown. Flesh, juicy, melting, sweet agreeable flavor, a little gritty at the cores Season, middle of October. A very good and profitable market fruit.

Bosc.—Tree, a vigorous but irregular grower, moderately healthy and, I think, quite as hardy as the Bartlett; productive, fruit evenly distributed over the tree, generally only one fruit on each spur, in place of clusters, as is common with the pear, ensuring nearly all fine specimens even in size and form, and free from blemishes. Fruit, large, acute pyriform, dark yellow, mostly covered with cinnamon russet, with occasionally a light touch of red on the sunny side. Flesh, melting, buttery, with a rich, delicious, slightly perfumed flavor. Season, middle to end of October. A very beautiful fruit, fine in quality, one of the best for home market, and will probably be one of the best for the foreign market; should be top grafted on a strong, hardy stock.

Anjou.—Tree, fine vigorous, spreading grower, healthy and hardy, but not productive. Fruit, large, obtuse pyriform, greenish yellow, shaded with brownish red. Flesh, juicy, melting, with a pleasant vinous flavor. Season, November. Fine for both home and foreign market, but too unproductive to be profitable

Keiffer.—Tree, a very vigorous upright grower, healthy and hardy; a very early bearer and exceedingly productive on account of its early bearing and great productiveness; will probably not be long lived. Fruit, medium size, ovate in form, golden yellow, with bright red cheek and russet dots. Flesh, half melting, juicy, a somewhat peculiar sweet but poor flavor; gritty at the core; too poor for dessert, but fine for preserving. Season, November and December. On account of its great productiveness and beauty, it may for a time prove to be a profitable market variety, but I am inclined to think that when its poor flavor

becomes better known it will not bring as good returns as it does at present. It has one bad fault: after coloring up and coming to maturity, the skin rapidly changes to a very dark and spotted color, giving the appearance of decay while still sound.

Winter Nelis.—Tree, a moderate but irregular grower, branches slender and straggling; healthy and hardy, productive; succeed best when top grafted on some other good growing stock. Fruit, small to medium, roundish abovate, yellowish green, nearly covered with russet patches and streaks. Flesh, fine grained, juicy, buttery and melting, with a rich, sweet, aromatic flavor. Season, December to January. When the soil is suitable and it can be grown to a fair size, it makes a good market variety, usually brings good prices and is about the only really good winter pear.

Amateur Varieties.

Doyenne D'Ete.—Tree, a moderately vigorous grower, upright, slender branches; hardy, but subject to blight; an early and abundant bearer. Fruit, small, roundish, obovate, yellow, shaded with a red streak on the sunny side. Flesh, juicy, melting, with a very pleasant, sweet flavor. Season, end of July. This little pear is well deserving a place on the amateur list, as it is the first to ripen, and although small and not of the highest flavor, yet being the first of the season to ripen, is usually much enjoyed.

Ott.—Tree, moderately vigorous; stout short-jointed branches; very productive. Fruit, small, roundish obovate; greenish-yellow, some russet, shaded with dull red. Flesh, juicy, melting, sweet, rich perfumed flavor. Season, August. A seedling from the Seckel, a very fine dessert fruit.

Clapp's Favorite—Described under market varieties.

Tyson.—Tree, a very vigorous growth, taking on a fine pyramidal form, very healthy and hardy, a very fine tree to top graft weak-growing varieties on; requires age before it commences to bear; moderately productive. Fruit, small to medium, ovate pyriform, deep yellow with crimson cheek. Flesh, juicy, melting, very sugary, slightly aromatic flavor, very good to best. Season, middle of September.

Bartlett.—Described under market varieties.

Seckel.—Tree, moderately vigorous, healthy and hardy, productive. Fruit, round obovate, dull brownish yellow with reddish brown cheek. Flesh, juicy, melting, buttery with a very rich spicy flavor. Season, October. The Seckel is generally considered to be the highest and richest flavored pear grown and is a standard of quality by which other varieties are very often measured. Originated near Philadelphia.

Sheldon.—Tree, a vigorous upright growth, hardy, somewhat subject to blight, requires age before commencing to bear, only moderately productive, should be gathered early as it is much inclined to blow off. Fruit, medium to large, obtuse obovate, greenish yellow, nearly covered with thin russet, brownish red cheek. Flesh, very juicy, melting, sweet rich vinous flavor, a little gritty near the core, very good to best. Season, October to November.

Bosc.—Described under market varieties.

Lawrence.—Tree, a moderately vigorous grower, forming a round spreading top, healthy, hardy and productive. Fruit, medium size, obtuse, pyriform, lemon yellow with occasional patches of russet. Flesh, juicy, melting, sweet, aromatic flavor, very good in quality. Season, December.

Dana's Hovey.—Tree, a vigorous upright grower, healthy, hardy and productive. Fruit, small, obtuse pyriform, greenish, yellow, netted and patched with russet. Flesh, juicy, melting with a very rich sweet aromatic flavor, best, nearly as good as the Seckel. Season, December.

Winter Nelis.—Described under market varieties.

Josephine de Malines.—Tree, a moderately vigorous spreading grower, productive. Fruit, medium in size, roundish oblate, pale greenish yellow, netted and patched with russet. Flesh, a delicate pinkish tint, juicy, melting, sweet with a delicate aromatic flavor, very good to best. Season, December to February. On young trees the fruit is occasionally poor and astringent, but becomes much improved as the trees advance in age and is then one of our best winter dessert pears.

Jaminette.—Tree, vigorous upright grower, healthy, hardy and productive. Fruit, medium to large, roundish obovate, clear green, becoming yellowish green at maturity, marked with russet patches. Flesh, juicy, buttery, sweet pleasant flavor, gritty at the core. Season, January to April. Although not of the best quality, it is a good variety to finish up the season with, by keeping in a cool cellar and bringing a few at a time into a warm room, they can easily be kept in use until April. I have not found late keeping winter pears very satisfactory. So far the Jaminette is the only one I have found desirable, as a late winter dessert fruit.

Mr. BOULTER: Pick out three of the best varieties of pears for general purposes—to bring in money?

Mr. BEMAN: I would take the Bartlett, the Duchess Precoce, and then Bosc.

Mr. BOULTER: You would throw the Flemish Beauty over entirely?

Mr. BEMAN: Entirely—too much inclined to spot. The Anjou is a very shy bearer; with me it is almost worthless.

The SECRETARY: You do not grow it on the dwarf, do you?

Mr. BEMAN: No, I was not very successful in growing dwarfs.

The SECRETARY: The Anjou is far more productive on the dwarf.

Mr. BEMAN: So I have understood, but I did not succeed very well with the dwarfs. I do not recommend any dwarfs for my locality. I have not seen any dwarfs that have succeeded so far.

TOP GRAFTING AND IRRIGATION.

By J. I. GRAHAM, VANDELEUR.

The subjects of top-grafting and irrigation was brought to my attention when I undertook to collect the fruit of our township for exhibition. In passing from orchard to orchard I was surprised to see the amount of poor, worthless fruit, and so many poor fall varieties I estimated there was over one-third that was worthless, and our local buyer told me that between a third and a half were fall varieties. When the buyer comes around he is told that he must buy these with the winter fruit, and that holds the price of the winter fruit down. I have been top-grafting for thirty years; I have a hundred varieties, and I am satisfied you can increase fertility by top-grafting; I refer more especially to the King. The Baldwin with us is considered tender, but where it is top-grafted it does not show the least sign of tenderness. For stocks, I find the common seedling is good, and I have found the Spy poor stock to top-graft; so also is the Baldwin and the Golden Russet. I have quite a number of varieties here, some grown on the original stock and some on top-grafts, which you may compare. But I have not noticed the differences referred to by Prof. Sears in the last *Horticulturist* in respect to the stock affecting the colour, keeping and taste of the apple. I have had success with the following grafts:—Hurlbut and Gideon on Ben Davis; Baldwin and King on seedling stocks; Hurlbut on seedling; Fallawater and Peck's Pleasant on Little Red; Cooper's Market on seedling stock

and on original stock; Spy on Crab stock and original stock; King on Ben Davis; Baxter on seedling; Yellow Bellflower on seedling; Hubbardston's Nonsuch on seedling and original stock; McMahon White on Fall Pippin; Baldwin on Rambo; Ribston Pippin on Little Red; Gravenstein on seedling. For scions, I am a strong believer in the individuality of certain trees I have noticed that in the Spy, the Pewaukee, and the Cayuga Red Streak. In a row of Spy trees there is one tree much earlier, much redder in color, and much earlier to bear. In the Pewaukees I noticed that one was of much higher color than the other; and I have noticed it in the Cayuga Red Streak so much that I asked one of the exhibitors to let me have one to send to Prof. Macoun to see if it was really that variety, and he replied that it was, but a remarkably good specimen of that variety. It is usually recommended to take scions from bearing trees. In taking off the top I would remove from one-third to one-half at a time. You must be careful not to expose the branches to the sun. I have quite a number, having a strip down the south side killed in that way. If you have not left sufficient foliage, you should use paper to cover the exposed portions. I would not cut a branch over two inches in diameter. If the trees are high I would use Ben Davis or Ontario—that is, if the apple suited me—to keep it lower. You have it much under your control by the variety you put upon it. Should you put Spy on a high tree, you are still running it up higher. If you require spreading, the Rhode Island Greening will spread. Should you come to a stock that is damaged, as I have done, and had doubts whether to graft it, I would graft it with an early-bearing variety. The Ben Davis will come into bearing the second year. In top-grafting, if you observe, you will learn a lesson on pruning that will be of use to you. It is a mistake, often made, to put in too many grafts. If a man is putting in for money, he will put in all he can, and if you have not knowledge you will sometimes put in too many yourselves. You should not have too many branches on a tree, but it is not good to cut off a large branch near the trunk. I need not speak of the waxing—you all know how it is done. In the summer I would re-wax them, or press it over again when the sun is warm. I would not have too many varieties; four to six I would consider quite sufficient for a commercial orchard. The varieties that suit me are: King, Spy, Baldwin, Rhode Island Greening, Ben Davis and Mann.

Irrigation.

The other subject is irrigation. My farm is on a mountain side In that valley, and at the base of the rock just under the brow of the hill, there come out little streams. These I run together and lead them across the orchard, and use them for irrigating the orchard and fields and the garden; also for power in the barn. I simply have to put stones in the ditch and it overflows and goes right down between the rows of trees whenever I want to water. Every year there is a month or two during which I find it necessary to irrigate. The ground is clay soil, and it would crack quite large cracks if not irrigated.

The Chairman; Are there many seasons during which you irrigate there?

Mr. Graham: I do it every season. There is usually a month during harvest season when it is dry. I irrigated the rows of trees, and I had a splendid crop of fruit. It is hard to say how much I should attribute to the water or the manure or the pruning, but I am well pleased with the returns. Some years ago someone asked Prof. Craig why it was the apples were rotting so badly that year, and his answer was that it was caused by the starting or stopping of vegetation—the checking of it by drouth and then starting of it by rains —and I noticed that year that my apples kept splendidly in the cellar. This year I was told up north that fruit would not probably keep well, Mine is keeping splendidly in the cellar.

The SECRETARY: Would you tell us any results of irrigation in the fruit itself—in its size or quality?

Mr. GRAHAM: Yes, even the Ben Davis. The water there is running the year round. At that end where the creek has been running all the year the apples were nearly a half larger than at the other end of the rows. The Spitzenbergs were loaded much heavier near the creek than they were last year.

Mr. BEALL: Do you cultivate your ground through the growing season?

Mr. GRAHAM: No, I keep hogs in it, and when the water is in it it softens it, and they do quite a bit of cultivation. The fruit business is an important one in our district. It is estimated that at Thornbury some $80,000 has been paid out during the season for fruit.

Mr. CASTON: There was one important point in Mr. Graham's paper, about the individuality of trees. I was very much interested in Prof. Sears' article. The question is, what effect it will have on the fruit by taking scions from a fruit that has a certain individuality about it, and also from a particular part of the tree? I sometimes have a tree that will bear heavily on one side and have no crop on the other. We often see that on the Northern Spy. The idea was to take our scions from the bearing side of the tree. We know how we can improve grain, vegetables, roots and that sort of thing by judicious selection. Could we not carry that out in fruit growing? I think there is a great idea there. It is said nurserymen take their scions indiscriminately. In top-grafting can we accomplish nothing in that line? I think that idea is probably new to the oldest fruit growers here—carrying out the individualities by top-grafting, as regards productiveness, color, early bearing and all other things that constitute a good fruit.

Mr. POWELL: I may say that that was the very thought I had in my mind to discuss here for you at perhaps this afternoon's session. I have been working a number of years on the same line as this gentleman, and I think it would be perhaps as important a line to discuss as could be taken up. (Hear, hear, and applause).

Prof. MACOUN: I would like to warn the fruit growers about top-grafting on Wealthy and Duchess. We have tried it, with the result that after several years those that had been top-grafted had outgrown the Wealthy and Duchess, and I expect we will lose the trees in a few years. There is a marked difference when you see the trunk very much smaller in proportion than the top. We are starting a series of experiments in top-grafting at the farm in Ottawa, and we are using the Haas, Mann and Crystal White as stocks, and I propose to use the MacIntosh Red as a stock; it is one of the cleanest trunks we have. I propose to graft them on seedlings of the Martha Crab, and then Rhode Island Greening on top of that, and I think we may be able to get some of the tender varieties to succeed with us.

Mr. MORRIS: I think the Professor will find if he buds the Crab it will houlder.

The SECRETARY: Has Prof. Macoun tried the Keiffer pear as a stock for other pears? Many of us will be inclined to graft our Keiffer pears to some other variety.

Mr. POWELL: For several years I have been working on Keiffer stocks with the Anjou and the Bosc. I have not attempted other varieties, but have been very much satisfied with the working of these two varieties on the Keiffer. There seems to be a perfect union, and it is a question which is raised as to whether the union will be perfect between other varieties and the Keiffer; and I find that in that respect the union is perfect, and I cannot see why the trees will not last well on toward a century. The Anjou is one of our most valuable pears, but very uncertain in its productiveness. Many orchards will stand for twenty years and show no fruit, and yet you take the Anjou and top-work it, or

the Keiffer, and my experience is it becomes one of the most prolific bearers. I have had it now nine years, and every year it is necessary to go through and thin the fruit, it sets so heavily of that magnificent fruit. There are just one or two points necessary in top-working the Keiffer stock. One of my neighbors, a very successful fruit-grower, has met with absolute failure in all his efforts, and I think he has made a mistake in cutting off the entire top of his Keiffer stock at one time. It is a very vigorous grower, and there must be some provision for the flow of sap in the Keiffer stock, otherwise there is a danger of failure; but my plan was this: the Keiffers were set as two year old trees, and allowed to grow one year; then I inserted only two grafts the following season. The next year I would cut off another branch, and the third year would finish the top-working. That left some Keiffer all through the period of changing the tree. The result is that when I had finished the third year the Keiffer wood was all removed, and I had my Anjou stock well established, and good strong top also from the scions that were set. Now in this case there was no check at all given to the tree, and the union has been perfect, and you can't see to-day where the grafts were set. The Bosc I think is a little more difficult, because the Bosc is not so rampant a grower as the Anjou; but I have met with excellent success in top-working the Bosc also from the Keiffer, and have to-day fine trees that are bearing annual crops and of the very finest quality. Now as to the other varieties I have no experience, because I limit myself to very few varieties for market purposes. Our friend Mr. Willard whom you have had the pleasure of having before your Association, has been writing me in reference to the working of the Bartlett pear upon the Keiffer, and I cannot say whether the union will be as perfect with the Bartlett as with the other varieties or not; but if this principle is used in working the tree over gradually, not all at once, I see no reason why there might not be a good union with the Bartlett or the Seckel, or any other variety that might be worked. There is where the important point comes in: do not cut your stock away all at once; take time, and I think you will be entirely successful.

Mr. SMITH: Can that rule be applied to all?

Mr. POWELL: I think that will apply in all cases, but you will not meet with the failures with the Keiffer that you will with others.

Mr. SMITH: Is not the Anjou a coarse feeder?

Mr. POWELL: It is; it will require a great deal of fertilizer. It also requires about as much room as a Baldwin apple tree. They are naturally a very large-growing tree; the roots and the branches spread so that we ought to set Anjou pears at least 35 feet apart. With me the Anjou has proved a healthy, fine, vigorous grower, with good foliage also.

Mr. MORRIS I would like to say one word with regard to pruning pears. The pear tops should be kept cut off, not allowed to go up in air, for then the wind takes hold of them and blows them down, and when a tree leans to the north-east the sun will strike the stem of that tree and it is going to die. There are more trees killed by the sun getting at the trunk than there are by blight.

Mr. GEO. E. FISHER, Burlington: I find the Anjou does not bear. I have a lot of trees, and some of them are large enough to have had 30 barrels, and they did not bear scarcely anything. How would it be to graft those trees with Anjou?

Mr. POWELL: I think the Anjou would be very much benefited by top-working. In a case like yours where they do not show productiveness, the very fact of cutting off your trees, even after they have stood ten years, and even setting Anjou upon Anjou, I think the effect would be to give you fruit on those trees. The tendency of the Anjou is to make wood; it is a wonderful wood producer, and the vitality seems to go to wood. Now, the checking of that by top-working would give you fruit.

Mr. PATTISON: Would not the ceasing of cultivation have the same effect?

Mr. POWELL : I hardly think so, because I do not believe the cultivation is detrimental to the tree at all. I think it is necessary. High culture I think is very desirable; but we must in some way give check to this wood-bearing tendency. And I think think there is no way so effectual as top-grafting trees after they have stood for a few years. My experience is on the Keiffer stock, they have been exceedingly productive.

Mr. PATTISON : Have you had any experience with Sheldon ?

Mr. POWELL : I have not grown the Sheldon, because it is so prone to drop its fruit. The winds, when they strike a crop of Sheldon, lay such a large proportion on the ground that I have not planted the Sheldon tree. Another point is, the Sheldon is not a popular fruit in the market. It is not appreciated, although I think it is one of the choicest and finest varieties of pears ; but its color is against it, and its shape also is undesirable, and so I have avoided planting it.

Mr. SMITH : I think that is a question that ought to be taken up, to educate the people to the use of the different kinds of pears.

Mr. McNEILL : Although we have no representatives to speak from the affiliated horticultural societies, we must not estimate their work by the amount of talk we have had from them. It is an exceedingly important work, and it has done more, perhaps, than any single advance that has been made by the management of the society for the extension of horticultural knowledge, and for fulfilling the objects of the Provincial Association. Their work has been a decided advantage to the Province ; and wherever there is a Horticultural Society located its influence is felt to a very large degree, and the Province owes a debt of gratitude to the managers for so faithfully following out the lines of work laid out for them by Mr. Thomas Beall of Lindsay, who is so intimately associated with them, and to whom so great a share of the credit is due

The CHAIRMAN : The Secretary has some correspondence on the fraudulent packing of fruit which he will read.

The Secretary read letters from S. Nesbitt, Brighton, W. E. Wellington, London, England, bearing on the subject. He also called attention to two baskets of apples on the table—one basket taken from the centre of a barrel of apples that had been packed for export, and the other of apples with which it was faced at each end.

HOW CAN WE PREVENT TRICKERY IN THE PACKING OF APPLES FOR EXPORT ?

BY A. H. PETTIT, GRIMSBY.

This is a subject that has been discussed by our fruit growers for the last twenty years, and we have as yet failed in agreeing on any definite steps that might be taken. Now, I don't think you can pass any legislation to make a man honest. You may correct some evils, you may improve the quality of our fruit by cultivation, by pruning, by spraying and by thinning, and thus get rid of a large proportion of this unsalable fruit that is being placed in the centre of barrels for the British market. We all know that the growers of this country have more or less inferior fruit. They are going to market that product, and they have a right to market that product, and I don't believe that any legislature or any government can pass a law to prohibit them doing so. But if we can raise public opinion to the point that it ought to be raised, then I take it we can reach the only feasible plan. For years I have advocated and urged that a system of inspection be adopted for apples. The point then asked was that the Government appoint an inspector to inspect such fruit as was offered for inspection. I do not believe that we can make a compulsory law that all fruit shall be inspected, but we can place it within the reach of a man who wishes to make a

contract for the British market, for example, to have the inspector see that the goods shall be up to the standard marked upon the barrel. If it is marked " No. 1 " that barrel shall contain No. 1 apples ; if it is " No. 2 " that it shall contain a certain grade of apples as set forth in that Act. Who is doing this fraudulent packing ? Is it the fruit grower of Ontario ? I do not believe it is. It is the speculators who buy very large quantities ; and when a man undertakes to cover such a large scope of territory and to handle such immense quantities of fruit, it is impossible for him to get men well enough posted to go about the country and put up those apples in the condition they ought to be put up Now, I do not think any buyer or shipper desires to have his apples put up badly, and if the Inspection Act was carried out, proper inspectors appointed at ports of shipment, and, if we could have local inspectors to inspect and brand those barrels before they leave this Province at all for the British market, then you would begin to work up the standard of Canadian fruit for market.

Now, I believe there is no country in the world that can produce better fruit than we can in the Province of Ontario, so when the growers do not pack their fruit properly it is a discredit to us all in the British market, and an injury to our business. I made a little estimate this morning, taking 300 barrels as an easy basis for figuring. Taking this year as an average price for Canadian fruit, the average in the British market will not exceed twelve shillings a barrel, which would be $900 realized on the 300 barrels. Counting the packing and shipping of the apples at 15 cents a barrel, and barrels themselves 27 cents, freight and commission $1.10 per barrel, a total expense of $236, the shipper will receive net $664 for his 300 barrels at 12 shillings a barrel. Now, let me take out 100 barrels, sorting them out more carefully, and put up 200 barrels at 15 shillings a barrel—that is a moderate estimate ; that will be $750. Deduct the same proportion of expense, $79, and this will leave the shipper $671, instead of $664 for 300 barrels, or a margin of profit that is as large by putting 200 barrels through in this condition as the 300. Now, he has 100 barrels or 300 bushels of good apples for the evaporator, apples that will bring him to-day in our market here from 25c. to 30c. per bushel. He can get that after he has taken out his seconds, all excepting the ciders ; but by putting this 100 barrels of seconds with his peelers, he will run the peelers up to 30 cents a bushel—we will put them at 25 cents a bushel, which will give him $75. He will then get $746 for his 200 first-class barrels and 100 peelers, instead of $664 on his 300 barrels. Now, besides all this, there is a great deal of waste of energy, a great deal of waste of labor and a great loss of credit. I believe if we look at this thing properly we will make more money by working along these lines than we will by shipping such stuff to the British market ; and I believe, more than that, that we can establish in our country a great market for evaporated fruits, and the more we can do to encourage this business and manage to dispose of the product in this country, the better for us. I was not prepared to deal with so important a subject today ; I have not come here with any prepared ideas on the matter, but I will submit this point : that I believe a system of inspection—a voluntary inspection for those who wish it—would be a step in the right direction to have carried out ; and I believe that thorough inspection at the port of shipment, where possible, and also in fruit-growing sections of the country during fruit season, will accomplish a good work and begin to establish in the British market Canadian-inspected apples as the best in the world. I get a great many catalogues of the sales of fruits of the United States, as well as the Canadian, and I fail to see that there is very much difference except in the barrel. I believe the American barrel is slightly smaller than ours, holding about a peck less, and the prices, as a rule, run about that peck less in value ; therefore, I believe there is very little difference in the standard of packing.

The CHAIRMAN : We would be glad to hear from Mr. Carpenter in reference

to these two baskets of apples. I do not think the farmers put up those apples, and I do not think the dealers are doing it blindly or without instructions.

Mr. CARPENTER: Before I left home, I suggested that it would be a very good idea to send a sample of these apples down here so that people could see what stuff was being packed; so I suppose they took the suggestion at home and sent them down.

I can't say those apples were packed for export, but one would suppose so, because they were labelled XXX, and with the best brand the man put up. They were sold to me for No. 1 apples, in fact XXX, as represented. I opened one barrel of Baldwins and it was supposed to be No. 2, and it was a fair No. 2 barrel of apples. I did not have any time at my disposal just then, but I thought the No. 1 would be quite satisfactory, as the No. 2 were fair. By a strange coincidence, there were five of these barrels left out of my shipment; they were taken down to my place and opened up, and they were five barrels of the vilest trash that ever was put in barrels. If they had simply been shovelled up they could not have got in worse trash. By a peculiar coincidence also, the man who was selling the apples made an error of $19 in my favor, and I thought he would write for it when he got home, but he didn't, and needless to say he will never get the $19. I have not any suggestion to make, for I have not studied or thought out what would be a good way to obviate this difficulty, but no doubt one way would be to put up fancy packages of apples.

Mr. CASTON: You say you did not buy those for export?

Mr. CARPENTER: No, I buy very few for export, a few car-loads perhaps, but I sold these in Ontario. The English market is so uncertain that where we can sell here for any reasonable profit I think it advisable.

The SECRETARY: I think it will be in order to read a resolution that was passed by a meeting of fruit growers in Grimsby on the 17th of June, looking to legislation in this matter, which resolution was forwarded to Ottawa and a favorable reply got from the Minister of Agriculture for the Dominion.

Resolved, That both the Dominion and the Provincial Legislatures be asked to consider the advisability of legislation to carry out the following regulations for the sale of apples and pears:

1. That all apples and pears packed for sale in closed packages shall have the minimum diameter of the fruit inside marked in plain figures on the top or face of the package, thus—2 inches, $2\frac{1}{4}$ inches, $2\frac{1}{2}$ inches, etc, as the case may be, and if more than ten per cent. run below the size specified, the package shall be considered fraudulently packed.

2. That all such packages shall also be stamped with certain grade marks which shall be defined as follows:

(*a*) X A No. 1. Sound apples or pears of uniformly large size and high color for the variety named, of normal form, at least 90 per cent. free from worm holes, scabs or other defects.

(*b*) A No. 1. Sound apples or pears of nearly uniform size and good color for the variety named, of normal form, at least 90 per cent. free from worm holes, scabs or other defects.

(*c*) No 1. Sound apples or pears of fairly uniform size, at least 80 per cent. free from worm holes, scabs or other defects.

(*d*) No. 2. Apples or pears that are disqualified from being classed under any of the aforementioned grades, but which are useful for culinary purposes, and not less than two inches in diameter.

3. That all apples or pears packed in closed packages be subject to inspection by the Government Inspector, and if, on opening one-tenth of the number of the packages of any one lot, these be found fraudulently packed, then the nine-tenths remaining shall be so classed, and the shipper be liable to a fine not exceeding 50 cents a barrel for all packages of that grade in the same shipment.

4. That provision be made for inspection not only at the ocean ports, but also at the request of the shippers, at local points of shipment in case of car lots.

5. That for local inspection a reasonable scale of charges be made of the shipper requesting it, guaged according to the number of carloads to be inspected.

6. That in such latter case the inspector shall apply some distinctive inspection brand to show that the packages had been inspected and found honestly packed; but, if found fraudulent, the inspector shall have power to forbid the shipment until properly packed and graded.

7. That in all cases the name of the packer and of the shipper shall be plainly stamped on the top of each package.

A. W. FARWELL (Oshawa): This is a vital point in our apple business. The whole profit in the apple trade lies in these two questions—packing and transportation. I know that there are apples shipped from Oshawa Junction that are put up the same as these. It is not done by the growers, but by the dealers. I have exported apples more or less for the last twenty years. I shipped the first car of apples that was ever billed straight through from Oshawa to Glasgow twenty-three years ago. Up to five years ago there was no dishonest packing done in our neighborhood; it was a straightforward business. The competition has become so great among buyers and they have become so anxious to gobble up the whole section of country that they go and buy up whole orchards by the lump. Previous to this we only bought what was shipping apples. We took what suited us, and we put up a good straight No. 1 apple and the farmer did what he could with the balance. Now the shippers take them to the fruit houses. There are four fruit houses at Oshawa Junction holding from 4,000 to 23,000 or 24,000 barrels each. The apples are picked off the tree, good, bad and indifferent, just as they come. They take them to the fruit house and they are sorted there. You can go into those fruit houses to-day and find barrels marked with the man's own honest name. You will see barrels in those fruit houses marked some other name that is not his name. Those that bear the real name are good apples every time. Those that bear somebody else's name or some factory's name are like those in the basket, and far worse than that. That is not a bad sample, for a small apple, at all. (Laughter.) I have shipped barrels of small apples to London before now, marked "culls," and got 16s. 6d. a barrel for them. There is no harm in doing that if you will mark them truly. If you send a good barrel of good apples, marked good, with your own name on it, all right, and if you send a barrel of culls so marked it is all right. But I contend it is all wrong for me to send a barrel with W. A. McBride's name on it, or Peter Dobson's name on it; and here is where I claim legislation should come in. I claim our Government has the power, and has the right to exercise it—to say that I shall not put somebody else's name on a barrel of apples for export. I make a good many thousand barrels a year for packing apples in. The Government says, "You shall make a barrel 17 inches diameter at the head, 27 inches between heads, 19 inches diameter in the middle, and if you pack apples in anything else then you will be fined 25c. a barrel." Why cannot they say that you shall put your name on it and guarantee what is in it or else you will be fined 25c. or 50c. or $1 a barrel? I do not believe there is anything in moral suasion in this matter; you may talk till you are gray-headed without doing any good When a man buys apples and mixes them up there is where the trouble comes in, and there is where the Government comes in and has to stop it, the same as they do the adulteration of milk and cheese. In those cases you have to stamp and sell it as it is; and when the Government tells the apple-packers they have to do the same we will have honest apples—and we never will before. (Applause).

The CHAIRMAN: That is just exactly the kind of information we want. There is something substantial in that; and I know there are men here who can give us a good deal more of just the same kind of evidence. I hope they will

feel perfectly free to do it. It is just what we want to approach the Government with.

Mr. CASTON: There is one thing I can hardly understand—the idea of packing those apples for export in that way, because in the Old Country the fruit is sold by brokers at auction, and they have a large basket; they take two barrels at haphazard and empty them out into that basket, and the lot is sold on sample. Now, if they happen to get hold of a couple of barrels like the sample before us, it will affect the whole shipment.

Mr. A. H. PETTIT: I quite agree with Mr. Farewell's idea in this matter; but how to reach them is the point at issue. I cannot agree that the shippers do this on purpose. It is because they can't control their packers. But the question I want to ask is this: A packer puts up his apples and he ships them with a through bill of lading to the British market; how are you going to interfere with his goods in this country? Can you step in and inspect his goods without his permission? He has a right to put those goods in the British market, and no person has a right to prevent him from doing it. How are you going to attack him? If you show me that you have a right to get at him, then I can see that legislation might be passed to check it.

Mr. FARWELL: I think we can get at him all right enough. Every shipment of apples is billed on a through bill of lading. There are three of those bills of lading attested to by the agent of the railways. He gives the shipper two. He retains one to be sent to the head office of the railway. Now, the Government can see that they make out four and send one bill of lading to the Department. Suppose the Government compels him to put his own name on every package of fruit he ships; they go through to Liverpool, and Shuttleworth & Co., or Woodall & Co., sell those apples to the retailer; they are opened up and they are found like this barrel. There is the man's name on the barrel. Word is sent back to Ottawa that such apples are a fraud The Department has the bill of lading there to find the very town the apples were shipped from. There is where you want your inspector. I know it is utterly impossible to inspect from ten to fifteen or thirty thousand barrels of apples down there in Montreal, suppose you had the power. How are you going to do it? When I ship apples in the winter I calculate them to get there just as late as it is possible to get aboard a steamer, and everybody else does the same. I have been in Portland when there were 257 cars of apples on the tracks, had to stay there three days, had to get a fire in the car to keep them from freezing. It has got so now that winter is the time of shipment, and every shipper times the arrival of his apples just as soon as the ship is ready to take them, and they are rushed in there night and day. How is it possible to inspect them? You might as well try to fly. You must do with it as you do with cheese. Turn to the criminal code. Every man is bound by his trade-mark, and if any man puts up his goods contrary to his trade mark then you can indict him. You cannot hang a man for shipping poor fruit. If he is fool enough to do it, and does not get the price for them, he will not do it more than once or twice.

Mr. MCNEILL: There is another difficulty in the way. As a fruit-grower, I would not trust those fellows on the other side with my barrels of apples. If I am not there, or my agent, to see that the barrels are bad, I would not take their word for it. There is another side to this story. A barrel is a different thing from a keg of cheese. When this apple goes over there I want some guarantee that the barrel that they say is a bad barrel, is certainly so. They say it is bad. I cant prove that it is not. We will have to—

Mr. FARWELL: Have a Canadian inspector over there.

Mr. MCNEILL: Of course if there was any means by which we could be perfectly certain that that barrel had not been tampered with—because it is an easy matter to tamper with a barrel, so that you still leave any label intact that

we put on, and yet it not be our fruit—but if there is any means of showing that the fraudently packed barrel had remained intact and the packer's name on it, then I would be in favor of his being punished.

Mr. PATTISON: The only way I can see to get thoroughly at the matter is to have an inspector at each station where the apples are shipped, although it involves more expense than I think we can manage. Then it could be easily found who shipped the bad ones and who shipped the good ones. Failing that, I think we cannot thoroughly get at the matter. In the one instance we are at the mercy of the man on the other side of the Atlantic; and although I come from there myself, some of their mercies are not very tender. (Laughter,) Whereas in the other case we are more or less at the mercy of the dealer, and his mercies are not quite what they might be either.

The CHAIRMAN: I would like to ask Mr Carpenter if the dealer's name, or any other name, or any other mark was on this barrel of apples?

Mr. CARPENTER: The dealer's name was on the barrel of apples in this case. I think they buy orchard's by the lump, and they want to make as much of the apples as they can, and they put the farmer's name on in the case of poor apples and let the poor farmer take the brunt. They come from W. A. Newton or D. A. Spears, or some one else, and the consequence is he has to foot the bill; so by the Government taking it up it would be a matter of protecting the farmer rather than doing him an injustice.

The CHAIRMAN: You got them practically from the man who packed them?

Mr. CARPENTER: Yes, but the man who packed them told me he packed them according to instructions.

Mr. PATTISON: Did he offer any excuse for the condition they were in?

Mr. CARPENTER: None at all; none.

Mr. EDWARDS (Peterboro'): Is this Association ever going to be strong enough, or is the Government going to be strong enough, to have representatives in England at the different points where apples are received, so that we may have a representative of our interests and the interests of Canadian sellers there? For it seems to me that that is of importance; and because of the statement that has been made, that it is desirable there should be an inspection on the other side, and there should be means of bringing home what is found on the other side back to the seller. That seems to be very desirable if it can be done. The difficulty, of course, is always in procuring the evidence and connecting the evidence with the seller; and the only way in which it can be obtained, and the interests of Canadians can be protected in connection with this great industry, is that either this Association or an association formed of those who are shipping, or better still, our Government, should have representatives at each port, and that they should look after all matters of that sort, and have means of bringing home every case of fraudulent dealing with the goods that are sent. Then, and then alone, I think, we can reach the trouble.

A. H. PETTIT: I may say that that is what we have at the present time—a gentleman on that side who is looking into the question in the interests of the fruit-growers of this country. This is the second year he has been in that position in the British market.

Mr. EDWARDS: With what result?

Mr. PETTIT: Well, no report has been published that I have ever seen, but I know that he is there, sent by the Departments.

Mr. EDWARDS: We should have heard something of it.

Mr. PETTIT: I know he does not speak very favorably of many of the fruits arriving in that country.

Mr. FARWELL: I am particularly interested in this point. It seems to me our Government should compel every shipper to put his name and address on every package of fruit he shipped, and with an inspector in each of the principal

receiving points in Britain all complaints of dishonest packing should be referred to him and he report on it. It seems to me you would then have control of the whole business. If a man over there buys a barrel of apples with my name on it, and he complains that it is not packed according to the stamp that is on it, the inspector goes and inspects that barrel, and probably all the rest. He may have bought a hundred, or three or four hundred, or may be three or four thousand, and he inspects different ones to see if they are up to the standard that they are claimed to be, and if he finds that they are like this barrel, or not up to the standard, then he reports to his Government. They, having the bill of lading, can look after him in twenty-four hours.

Mr. EDWARDS: It would be very easy, it seems to me, to connect the actual packer with the trade-mark and avoid the danger of the packer putting on the farmer's name on a barrel, and so endeavoring to hold the farmer responsible where he simply sold and the packer did the fraudulent packing, by providing that every one who is shipping should have his name or his trade-mark, or whatever it may be, registered at Ottawa, so that no name could be put upon any package but one which was registered at Ottawa, whatever it might be. when the packer would have to put his own name, and if the farmer's name happened to be registered the farmer would look after it himself and see that what was going on under his name would be protected.

Mr. MCNEILL: I went into one of the largest packing houses of Ontario—I hope I am not open to any slander—and saw apples packed just exactly like this one, and being a visitor there, by courtesy I could not of course get on a righteous indignation as I would anywhere else, and so with my sweetest smile I insinuated that it was not the style of packing that I thought best calculated to hold the English market; and he said, "Oh, these are not our packing; these are all ordered." I said, "What do you mean by that?" "Why," he says, "so many barrels of this brand are sold to the English trade." He afterwards explained that the English buyer bought these apples to be packed in this particular way. On my part I would not do like that for anything; but it was a mere matter of business—they were ordered to be done in that particular way. May be he was slandering the English buyer, but he said it with an air of truth that staggered me, and I was half inclined to believe what he said.

Mr. FARWELL: It is a conceded point that illegal or dishonest packing is perpetrated every day. The only question is, How are we going to stop it? In regard to the fraud suggested by Mr. McNeill that might be perpetrated in England—and I am sorry to say there are scalawags there the same as in Canada—there might be some plan adopted the same as in handling coal oil from the United States. When we get a barrel of American coal oil here it is inspected, and we have to erase or spoil the inspection brand before the barrel leaves your premises, under penalty, and a very severe penalty. Surely the men whose business is to get up Acts, who are experts at it, could conceive some way to cover all these little loopholes, and it seems to me they ought. (Hear, hear).

Mr. CARPENTER: I think we are getting an inspection too far away from home, I think we want an inspection before they leave here. I do not think we want it on the other side at all; for this reason: All apples do not carry in the same condition It depends on where they are placed in the steamer, and how they are carried, and how many days they are going over, and so on. I think the inspection should be here so that we would know we were not getting defrauded.

Mr. CASTON: Is there not a system in the Old Country by which the retailer has twenty-four hours in which to return the stock back to the brokers?

The SECRETARY: There is such a regulation.

Mr. CASTON: I think Mr. Farewell struck one important point in regard to buying orchards in the lump. The dealer is anxious to handle all he can, and he

buys more than he can handle, and sometimes he cannot get hands enough. Some Bay of Quinte men were up in the Georgian Bay district, because they all made money last winter. They could not get enough men, and owing to the unseasonable weather after the drought the apples began to fall, and I believe fully half of the apples are windfalls, and they are stored away now for packing. How those apples will come out it will be for the future to reveal, but I think it will be a sad tale of woe this winter. In the old way of buying apples by the barrel I think there were far better apples put up. I do not see why the farmer should not sell the surplus apples to an evaporator as well as the dealers.

Mr. GRAHAM: In the Georgian Bay district the apples are nearly all bought by the packing houses. They mark on the barrel "store" on the winter apples. I saw them on a long table. They empty them out and re-pack them, and they have a paper with their name cut out, stamped on it, the full size of the end of the barrel; they put that inside the lid when they are selling, so if there is fraudulent packing done it must be in the houses.

Mr. PATTISON: Could we not get at a basis to frame some sort of Act to check this by appointing a committee of fruit growers to confer with a Parliamentary committee, so that between the two they could draw up something satisfactory. It is admitted on all hands that there is fraudulent packing, and that it is vital to the fruit trade of the country that this should be stopped.

Mr. PETTIT: I think we all admit there is a very great and growing evil in the country, this bad packing of fruit. This resolution (of June 17th) was passed by a meeting of fruit growers this last season, and I will move that this resolution be endorsed by this meeting.

Mr. MURRAY PETTIT: I beg to second this resolution. I helped to draft it, and I think that although a step in the right direction it is not half thorough enough.

Mr. McNEILL: I quite agree with the spirit of the resolution, but one thing will have to be changed. It seems to me impossible to indicate the sizes in inches when we are talking of different varieties. What would be a splendid specimen of this apple (showing sample) at that size would not pass at all in that variety (showing another sample).

Mr. POWELL: In our country the American Apple Shipper's Association have substantially taken the same action that you are considering to-day; and to cover the point raised last they classify the apples that will cover the $2\frac{1}{2}$ inches diameter, which shall be of the grade of Fameuse, McIntosh Red, and that class which are recognized as only medium apples in size, while with the larger apples they are classified as the Greenings and the Baldwins and the Kings, and the larger grade is recognized by the variety. That is very easily reached in that way. (Hear, hear).

Mr. FARWELL: I do not think that you can grade the Baldwin along with the King. Some years the Baldwins are small size, yet they are perfect, clear from scab and worms, but still a little under size. Other years they will be a little large. You will get a 3 inch King almost anywhere, while a 3 inch Baldwin is a very large one. I think it would be better to allow the dealers to put in their apples according to their own inclination, and grade them themselves, and put their name on them, and put it on the outside. I cannot conceive what good the name of a dealer is on the inside of a barrel. No one but the person that uses them see it. But it wants to be on the outside, and the grade of the apple, whatever he calls it, on the outside also. Again, you take the Golden Russet, and you will find many a barrel of fine apples that are very small, that will run down to $2\frac{1}{4}$ or $2\frac{1}{2}$ inches, and then you will find some other orchards that will run up to 3 inches. The inferior ones are good apples, though not worth as much as the large ones, if they are good apples, if I mark them what they are, and the dealer over there buys them according to my guarantee. I would make the shipper

guarantee everything just as he markets it. There is no difficulty in getting at it, though ; the only difficulty is to get the contents of the barrel guaranteed the same as marked.

The SECRETARY : I do not think this question of grades is nearly as difficult as it seems it might be. In Grimsby we have been exporting in fancy packages to Britain the past season, and using the identical grades mentioned in this resolution, and the apples less than $2\frac{1}{4}$ inch diameter have been marked "small" or the word "dessert" might be used, and then apples larger than A1 have been called Extra A1. That covers an apple like the large Kings. So by using such definitions the whole matter is disposed of. I think that will adjust itself very easily, and it is a great help in making sales I made a special sale of fifty barrels of Spys this summer to a buyer in Liverpool, just by defining the lowest size that would be in the barrel. They were to be above $2\frac{1}{2}$ inches in diameter, and this was the most satisfactory thing I could say to him in making the bargain ; and I believe it is going to facilitate the direct sale of apples to consumers or to individual buyers, or retailers in the old country, more than anything we can possibly do, because we can define the sizes that we intend to put in our different shipments, and that is one of the very things they are anxious to know.

The resolution was then put and carried unanimously.

THE PRODUCTION OF HIGH-GRADE FRUIT.

By G. E. POWELL, GHENT, N. Y.

It gives me very great pleasure to meet with you, and I have enjoyed exceedingly the discussion which has been so active, which has just closed. In the short time which I may engage your attention I should like to speak of the importance of producing more high-grade fruit. One of the solution of this very problem which you have been discussing is to eliminate as far as possible inferior grades. My first suggestion would be that no fruit grower attempt more orcharding than he can handle well. (Hear, hear). I think if there is a mistake, perhaps on the part of all of us, it is that all of us, it is that we are too anxious to extend our acreage, when the aim should be to produce more and finer quality. Now, this calls at once for the discussion as to how we can reach more high-grade fruit in our cultivation of orchards. We should start at the foundation of this question. I believe we should recognize the fact that we must deal with the soil itself as one of the first requisites of successful fruit culture. We are all of us now attempting to carry on a line of business which requires a high degree of knowledge and skill. Our soil has all been devoted for many years first to the production of cereals. After the growing of cereals for many years we have taken from the soil the cream of its plant food, that which is so essential to the production of the finest fruits. We recognize the fact that when we come to virgin soil, there we grow fruits in great perfection ; that upon virgin soil we have less of difficulties to contend with, simply because that soil contains the fullest abundance of plant food to give the most perfect condition of growth of tree and also development of fruit. Another point which occurs to me is this ; that in the very rapid destruction of our orchards we have changed somewhat the best conditions for general fruit culture. I know it is true in my own State that since our forest preserves have been so denuded, that during the past quarter of century we have been visited with great extremes. It is the rule for us to have extremes of temperature, very low ruling temperature suddenly, frequently coming upon us during the winter, and extremely high temperature ruling at certain times during the summer with very frequent and prolonged droughts. The result

is that our fruit trees to-day are subject to very severe changes, and the vitality of trees become impaired, and when that is the case it is with great difficulty that we can produce such a high-grade fruit as we should like to. Now, for the short time that is given us this afternoon I want to speak of the importance of the right.

Propagation of Fruit Trees.

I believe we have got to study the question of constitutional vigor in trees, and for a number of years I have been working upon this line, testing the value of selection of trees according to constitutional vigor. With us in New York State the King—which I might say, perhaps, is the king of all varieties, representing such very fine high flavor, representing such beautiful color, and representing (for at least a large portion of the trade) such desirable size — the King stands out prominently as one of our highest-prized fruits, and yet over a very large section of New York State it is by no means a safe apple to plant. It will not last to exceed fifteen years. At the very time when the tree should be coming to its greatest usefulness it begins to decline and fail, and at the end of twenty years King orchards have virtually passed out of existance. We recognize the fact that the King is constitutionally defective, and hence it cannot be recommended for general cultivation. At the present time I am extensively planting the King, but not upon its own body or upon its own root, but rather employing the principle which was somewhat discussed this morning, of top-working. I shall be very glad to give you as briefly as possible some outline of this method. I believe the principle of top-working is one of which we have not fully appreciated the value. I believe through the principle of top-working it is possible for us to largely reduce the time in which orchards may be brought into bearing. I believe that even with the Spy, by suitable top-working, we can reduce the bearing age of a Spy orchard a number of years. (Hear hear.) In the pruning of different trees, I discovered the fact that in pruning Rhode Island Greening, or in pruning the King or the Baldwin, that it was comparatively easy work. Half a day, or an entire full day, could be put in pruning without any very fatiguing labor, but when the Spy rows of trees were reached I invariably found in my own personal experience in pruning that I was pretty well tired out even before noon hour—that it was a vastly different thing pruning Northern Spy trees than pruning Rhode Island Greenings or Kings — for the reason that the wood of the Spy is so much more solid; it is so much harder in its texture that it is vastly more laborious to do pruning in the Spys than in many other varieties. This led me to the examination, then, of the woods of different varieties of apples, and the further study of the value of this stock to top-work other varieties upon; and about eight years ago I started in with the propagation of the King apple upon the Northern Spy stock.

I chose the Northern Spy from the discovery of its being an exceedingly hard textured wood, and hence also being a vigorous, thrifty tree in its growth—a most desirable stock on which to top-work other varieties. Now, in studying upon this question I want to emphasize the remark that was made here this morning in the belief in the individuality of trees. It is undoubtedly true that trees have their individuality, and hence in this principle of propagation we must study the traits and the characteristics of trees' growth, and we must study the individuality of trees, and not select promiscuously even from the bearing trees from which we are to propagate. There is individual force in the fact that the propagation of trees in the nursery from immature trees has the tendency to prolong the growth of trees certainly in the orchard. I think it is not materially different in the propagation of trees from the breeding of animals. All who are in the line of stock breeding understand that there is no wisdom in breeding from the young or immature animal; that the best results are obtained from breeding

along more mature lines of stock. This truth I think will hold equally well in the propagation of trees. If we are multiplying continually year after year from the young, immature stock in the nursery we are inducing in the propagation the continued growth of wood, as that is the function of the young tree of the nursery, first to develop and produce its wood ; and if we propagate from that source we are simply pushing that development of the wood growth to a longer period than we would if we selected our propagating stock from the more mature tree. Now upon this point let me say that in the selection of this propagating stock it is important to take a number of things into account. First we should study the tree as I have said from the standard of its individuality. We will understand as we go into a block of trees that there are those that require little pruning. They seem to be from nature well-balanced trees. They seem to grow in all directions naturally and well; and we will strike many trees like this in our work which require comparatively little pruning. They seem to grow out as well balanced in all directions, and their growth seems to be such that they naturally grow into a fine and perfect tree, eliminating very much of the labor of pruning; while on the other hand we still see trees that are inclined to fill up with massive growth of wood, and it is necessary to go in and prune severely in order to throw that tree out into the shape we would like to see it acquire. Now, in the selecting of propagating stock I would make a very careful study of this principle. And so in starting this orchard of Kings upon the Spy, it was my privilege to send to Tompkins County in New York State where the King grows to the greatest perfection. It is recognized that in Tompkins County, surrounded by lakes, the King does its best, and so pains were taken to send to this county to take the propagating stock from this section, and then from only what I describe as typical trees. I stated to the gentleman who got me the scions. " Now, study the tree in every respect closely and carefully. Study the tree in its form, and only select scions from the trees that are growing naturally in a perfect form." Secondly, the request was to study the character of the fruit. We all know that there are differences in trees in relation to the character of the fruit which those trees will produce. Some will produce uniformly good fruit, while again the tree next to it will produce a larger proportion of inferior fruit. There is where the individuality of the tree manifests itself again. I cannot explain it, but there undoutedly is a difference in trees in assimilating the nutrition which is obtained from the food and the soil ; and perhaps the greater power of assimilation of nutrition may make the difference between a tree that will produce a larger proportion of excellent fruit, as against one that will perhaps produce a larger proportion of its fruit inferior in quality. So the quality of the fruit and the character of the fruit was studied along with the natural form of the tree, and in this manner these scions were selected. The were placed in trees that were set out eight years ago two years of age, and at the second year the progagation began. Now as to the results. It has been a very interesting study all along to note the development of those trees. All along on this first system of propagation there were distinct differences in the forms of those trees. Some came into form beautifully. You could select here and there, all through this plot, trees that from the time the scions were set until the present time have been developing naturally very fine trees. In addition to that the same characteristic seems to have followed in the perfection of the fruit. The fruit is uniform in size. When you have picked Kings from these trees you will find that as they lie in a pile it is a very uniform lot of apples in regard to size. Evenness of sizes is marked in the production of some of those trees. Then again, the uniformly fine color which comes out upon them. So that the tree seems in this first experiment to be working out, proving that there is individuality in trees, and it is for us now as fruit growers to study and learn these, and then make use of them as far as we can. Now, then, to carry it further. In the planting of a

second block the selection would be made still from the finest of those that have first been started ; and I find that out of a lot of 100 trees that the selections came from less than half a dozen—the perfect type is found within half a dozen. And so by the selection from those fine types the chances are in another block to increase this per cent. or larger number of typically fine trees ; and I certainly have faith in this principle of propagating trees. (Hear, hear). I believe if we study it sufficiently and understand it sufficiently that it is possible for us to eliminate in our culture a large proportion of the inferior fruit which is now produced upon our orchards. I am quite well convinced in my own mind that we do shorten the period of bearing—the number of years. At the end of eight years it is now possible to take from these trees well toward two barrels of fruit During this past year, in propagating on this same tree from later winter sweets, at the end of six years there were trees that bore a full barrel of apples. At the end of three years propagating with the Sutton Beauty—another apple which is receiving a good deal of attention in New York State—at the end of three years I was able to take from these top-worked trees this year two bushels of apples from the tree; showing that the tendency of early development by the selection of buds from mature trees must have some force in it. We know that top working will shorten the period in any event; but if we choose buds from trees that show in the first instance a strong tendency to early bearing I think we can bring down the period of bearing a number of years, and that is an essential point in this propagation, in addition to the other points that I have raised—to note the tendency for early productiveness, early bearing, and where we note that tendency to select our buds from those trees. I want to show you some wood taken from these trees, which I have brought with me. I hold in my hand some wood taken from the trees at the end of three years that produced two bushels of apples, showing a very fine development of fruit buds upon this wood at the same time that this fruit was borne during this past season. Now, in addition to the producing of two bushels of apples from this tree, although we have had a very prolonged drouth this past season—I think the worst drouth I have ever experienced in my business, no rainfall to wet the ground for six months to any depth whatever—you will see that there is a fair growth of wood upon these trees right through the severe drouth. The fruit was developed in the very highest perfection, and at the same time there is a very remarkable development of fruit buds for the coming year. So that it gives me strong faith in the principle of the judicious selection of stock to propagate our trees from. While upon this subject, tillage comes in, of course, as a very important part of this whole question. I believe we should push the question of development as rapidly as it is possible of all our trees. By the vigorous development of trees I think we put them in a position to resist diseases, to more effectually resist the insect attacks. If a tree from any cause is standing still that tree is certain to be afflicted with all sorts of troubles, diseases and insects ; and hence if we can bring to our orchard management a high degree of culture, putting our trees in the most thrifty growing condition, we shall solve in this manner to quite a large extent some of the difficult problems of the infliction of diseases upon our trees. So I am a believer in very high culture ; and here is an evidence of the rapid development that may be brought to trees in the bearing tendency. I hold in my hand peach wood from trees that have not been set yet two years—set a year ago this last spring—that are to-day fully developed with a strong set of fruit buds, and I can only attribute it to the special culture which has been given these trees during the two summers that they have been growing. You who are peach growers will recognize that there is a very full set of buds upon trees that have been standing in the ground but a little over one year and a half. Now, these trees were struck the year that they were set, in 1897, by peach curl to an extent that the foliage was

nearly sacrificed for a short time, but they rallied quickly from it. We commenced our spraying just as soon as we discovered that the trouble was coming, although that was too late to be the most effective; but we sprayed at once on the first indication of the appearance of this peach curl, and the result was we brought out a very fine foliage very soon indeed, and the check really was not so severe as it promised even that first year. The growth has been kept up continuously since, and the result this year is an exceedingly fine development of fruit buds, as you will see upon that wood, as the result of overcoming a bad start and catching up of the loss that was made from the visitation of peach curl during that first year. To show fruit in two years is a remarkably quick development of the peach, and it only shows the possibilities that lie within our means of bringing orchards into early bearing. I want to speak now in connection with this principle of propagation, and the mode of giving attention to our soil. Along with the top-working, and along with judicious pruning, we must see that our trees have the most perfect nutrition. I was interested in the dicussion this morning touching the development of fruit buds. It is a difficult question to explain. The scientific man finds difficulty in explaining just the whole process of the development of fruit buds, but it seems to me, from the closest observation which I can bring into my own business, not as a scientific man but as a cultivator, a fruit grower, that it is largely a question of nutrition. If your trees are properly supplied with plant food that is easily and readily available, it seems to me that is where the question lies largely. If there is the most perfect nutrition of the tree it will go on and develop those fruit buds either earlier or later in the season, but they will be developed strongly and thoroughly in proportion as is the most perfect nutrition of the tree. Now then, if we recognize that fact, then comes the important question, how can we bring to our trees the most perfect nutrition? I believe we have never yet fully understood the real philosophy of tillage. I believe the principle object of tillage is to get at the nutrition in the soil for our trees. I understand tillage to put the soil in the finest possible condition for our trees to utilize the plant food that is there most abundantly in all our soil. So in connection with this subject of the early development of bearing orchards, I followed a system of tillage which I will give to you as briefly as possible, and it may perhaps explain this very wonderful development of the peach buds upon this wood. As I said a few moments since, we are trying to grow fruit upon soil that has grown wheat and corn and hay and potatoes for many years. We have lost all of the older cultivated soil. We have lost one of its very essential elements to a large degree, and that is the humus of the soil. When the soil has lost largely of its humus it then feels drouth severely. It is thus that trees cannot receive the best nutrition, because it is through the principle of humus that the best action in the soil is carried on—the liberation of plant food, the retention of moisture, of water, to be carried through periods of long-continued drouths; and so for the past number of years I have been working along this line of re-incorporating in the soil a liberal amount of humus, and in my own particular case have been working with the crimson clover, now for eight years—first cultivating from the very earliest opening of the spring, bringing to that soil the most frequent culture that time would admit of giving, because in the earlier part of the season we must get the best development we can in the growth of our trees. Our fruit is made in the early part of the season; that is, it is given its best condition by the early tillage which we bring to the soil. We put our soil into the best possible condition through the very earliest tillage that we can bring to it, and then the most frequent tillage from that time up until the wood has been well grown, which will be in New York state somewhere about the middle of July. The frequent and constant tillage makes it possible for the plant food that is in the soil to be most readily liberated, so that the plants, the trees, the vegetation, whatever we are cultivating, can get that

food in the most available condition. When we have cultivated in this manner, when we have reduced that soil to its finest condition which I have indicated, which is so congenial to the roots of trees and plants, we naturally then must protect that soil from the loss which will follow in the after months. And so high tillage—the very thorough tillage which I am advocating now for orchard culture—will be destructive to that orchard unless we provide for the loss which certainly will follow unless we cover that soil during the next months when growth ceases for some plants. And so I believe in the winter covering of every acre of land that is brought under this system of high tillage; because you can see that when we have gone over a piece of land continuously week after week by this finest possible culture, we have exposed that soil for the balance of the season to rains and storms that will be most destructive of the plant food which we have so abundantly liberated through the process of tillage. So you should always follow this system of tillage by covering that soil with some growing, living plant for the following autumn or winter. I have been very successful indeed with the use of crimson clover; and I say crimson clover for this reason. It being an annual plant, it furnishes an opportunity, in the climatic conditions which surround me, to push this system of tillage for the finest development of our trees and our fruits earlier in the season; and then they have a plant that from its nature, being an annual that will grow rapidly, is especially adapted to sow upon the soil after the tillage ceases, and it covers that soil with a heavy, thick matted cover which protects it from the down-pouring and beating rains, and holds the nitrates which have been liberated by this high tillage. and so protects that soil from the serious loss which would ensue if it were left in a naked condition. Now the question which will arise in your minds is, can the crimson clover be grown by you as it can be grown by me? That is a matter for you to determine by experiment. Undoubtedly you have experimented with it here; but there are other plants that can be used. Among the pea family there are plants which can be used where perhaps crimson clover would not make a cover that you would like, and so you are not confined simply to the clover plant, but you can choose from others that will grow and make a cover for the winter. There is little to be said about peas; they are of course stricken down by the first hard frost, and you do not get quite so valuable a cover with peas as you do with ordinary clover.

Mr. CASTON: Do you mean the ordinary peas, or cow peas?

Mr. POWELL: The cow peas. But, with the thin roots that come from the pea plant, it helps to hold the soil together better, and I would rather have the peas if I could not grow the clover. If the soil is not covered with snow—and I apprehend that you have much more cover of snow here than we have in New York State, particularly in central and southern New York, where it is seldom that we have our land covered of late years with snow—I would rather incorporate with the peas, if the clover does not meet with your wants here, a little sowing of rye or wheat or grain. Any plant that will go through and keep its life during the winter will help to hold your soil in finer condition if you cannot carry the clover through the winter. So I would say, as a suggestion, to accompany your peas with a sprinkling of the rye, that you may have living roots, a living plant upon your soil all through the time of the winter months; and in that case you can get all the benefits which I have been speaking of here in the culture of the clover. Now, the clover culture, or any culture in this direction of the leguminous plants, it is surprising how they will restore the soil in plant food. I have met with some very great surprises in the use of crimson clover, and I am very glad to give you some positive figures in the matter.

Crimson Clover as a Green Manure.

Analysis of Soils.

	Three crops clover.	No clover.
Water	15.00 per cent.	8.75 per cent.
Nitrogen	.21 "	.12 "
Humus	2.94 "	1.91 "
Phosphoric acid available	.015 "	.008 "

Difference in favor of soil covered with clover.

Water	6.25 per cent. equals	46.875 tons
Nitrogen	09 " "	1,350 pounds
Phosphoric acid	.007 " "	105 "

The soil was alike. There were only a few rods separating the places from which these samples were taken, and hence all conditions were similar. The chemist found in the clover treated plot 15 per cent. of water, after he had gone through the processes of drying that soil out as much as possible, as against 8.75 where no clover had been incorporated whatever. Now, these samples were taken at the end of a six weeks' very severe drought; we had no rainfall for six weeks. The ground was absolutely dry, or it seemed so, and yet there was the difference that was found at the end of that period of six continuous weeks of drought—47 tons of water more per acre on the clover-treated soil than on the other. That has explained one thing in my own culture, that I have been enabled to carry through large crops of fruit with apparently no loss for the want of water. The tillage, in the first place, as I have explained to you, has helped to conserve the moisture with it in the sub-soil. That was a help all through the early part of this dry period. That constant tillage just held down and kept down the water supply that naturally passes up by evaporation and so lost. That was held down and passed through the roots of the trees, and the result was that large crops of pears and apples have been carried through these droughty seasons without any apparent loss or damage except a little diminution in the size of the fruit. So that the difference in the water contents is very marked indeed, you see, between these two samples of soil. I want to speak of the humus next, because it is so closely connected with this water question. The chemist found in the humus portion of his work 2.94 per cent., as against 1.91 in the other soil. There is the explanation of this whole question of the water supply in the soil. You see, the largely added amount of humus made it possible for that acre of land to carry out and to hold and to distribute for a longer period that amount of water. It was by filling up the soil with all these millions of conducting roots which this plant gives to it, thereby re-incorporating the lost humus material, that it was enabled to hold and distribute and carry out that larger amount of water to the acre; so that the humus is very closely connected with this question of the water supply in the soil, on the very principle that you will readily understand, that a sponge will take up, and take up, and take up water continually, and then it is a long time before it gives it all off. On the same principle the humus acts on the soil as sponges can in retaining water. Now, the next important figures in this experiment relate to the nitrogen. While these trees have been carrying large crops of fruit the trees have also been making a liberal growth of wood. These two things do not go together always. You will find that the heavier the growth of your fruits upon your trees, the less growth there will be of wood, and especially if a large crop is produced in a droughty season, you get scarcely any growth whatever of new wood. Many of you will recall that there would not be an inch of growth upon a pear tree grown in a dry season that was producing a large crop of fruit—absolutely no new wood made; yet in this pear orchard, where this growth has been going on, they have grown crops and at the same time made from 1½ to 2 feet of wood. So the soil has been well supplied with nitrogen, which is a very essential element in producing wood upon our

trees. Now, what proportion of nitrogen has been brought to the soil? A chemist was with me from Cornell University, and in listening to the discussion of the growth of wood and the production of wood through droughty seasons at our farmers' institutes he said to me once "Do you know what you have been doing with this clover business?" I said "No, only in a general way there has been vigor and growth of tree, and there has been productiveness of fruit, but I can say only in a general way, not being a chemist." Then he proposed to analyze all these soils himself, as a chemist only can determine accurately just the operations that are carried on by the growers and fertilizers, and so on, in the soil; and when he reached the nitrogen results they were astonishing. He found .21 in the clover-treated soil, as against .12 in the non-clover soil, and the difference of .9 per cent. of nitrogen in an acre of soil 13 inches deep is 1,350 pounds. Now, to have purchased that nitrogen and put it on an acre of soil during three years, at the low valuation of 15 cents a pound, would have cost me $202.50; and yet that amount of nitrogen was added to the soil, with possibly a little liberated by the process of tillage, but largely this amount was added by the clover plant itself, showing how economically and how rapidly we can build up the lost plant food in our soil by the incorporation of a plant like the clover plant. And the peas, of course, will do the same as the crimson clover has done. That, it seems to me, is one of the most inspiriting lessons I have ever learned in my orchard management—that it is possible for us to go on and continue to grow fruits, and at the same time improve our soil. Now, that is a very important statement to be able to make. The general processes of production are destructive. Here is a practice which we can pursue of high tillage, and when we have finished our high tillage we can incorporate in our soil a plant that shall at the end of the year, the same year that it has produced its crops, leave that soil even better than it was before. That is a very great statement to be able to make, and a truth very important for us to realize. So that we have not yet learned the value, in our orchard culture, of incorporating a clover crop at the latter part of the season, after all cultivation and all production has passed by. Now, one other point in regard to this chart, and that is the phosphoric acid. The chemist found .015 per cent. in the clover-treated soil, as against .008 in the other. The difference in the three years made 105 pounds more available phosphoric acid which he found in the soil. I asked him to explain how it was. By the incorporation of the larger amount of humus, the larger amount of humic acid which is produced in the soil set free more largely the phosphoric acid that was available for the use of the plant. He has not worked out yet the potash results, but he indicated to me that they would be undoubtedly as striking as the phosphoric acid, showing that before we expend the money to any large extent for an artificial fertilizer it will be wisdom for us to utilize that which is in the soil to-day abundantly. Your soil is not impoverished here. You have a magnificent soil, particularly here in Ontario, and I have no question of doubt will be productive for hundreds of generations yet to come. (Hear, hear.) It is only a question, while all these processes of production are being carried on, of re-incorporating through these plants that have the special power to build up in the soil its most important elements, humus and nitrogen, and you have production here for unlimited ages to come; and generation after generation can go on, and your soil will be better a hnndred years from to-day than it is now. That is the possibility. I think when we can so handle our land that each generation shall find it better than the preceding one, that we have reached certainly a very valuable line of work and discovery in the culture of our land. (Applause.)

Mr. A. H. PETTIT: You make no account of spring growth of the clover plant. You plowed it from time to time in the spring?

Mr. POWELL: Yes. With me, I prefer to get that growth in the autumn. A great many say, "Suppose it winter kills, isn't there a loss?" No: you have

made your gain in all the growth that you got from July or the first of August up to the winter. The plant has done its work; the nitrogen is in the soil; the humus is there, and if it winter kills, although I would rather have the living plant, it is not materially a loss. Now, suppose the plant goes through and comes out in the spring alive. I prefer not to have any spring growth, for this reason: We have all experienced this past year a very serious drouth. It is what is the matter with all our apple business to-day; the longer period of dry weather, followed by an exceedingly warm autumn, has brought the apple business into a condition of national calamity; that is just what it is to-day. In the spring we want to avert all the loss of moisture that we can. If our clover begins to grow in our orchards during the spring, the plants are just pumping up the water that is now being stored during these winter rains and storms; and so I prefer to put the plow in and plow it down, even if it is alive, on the very first day that it can be done in the spring. Stop the growth; stop the pumping up of this water through the growth of the plant, and put it under through tillage at the earliest possible moment; and then, after we have got the growth of our trees re-incorporated, plant again the latter part of the season.

Mr. TWEEDLE: Do you find the take of clover the second and third year easier than the first?

Mr. POWELL: Decidedly. When I first sowed, although I had great faith, I sowed something like ten acres as an experiment. The next year the growth was very much better. The third year it was decidedly better, and now I have no failure at all with it, even during this past season of drouth. I have 70 acres covered to-day with the clover that has just simply gone on and made a good covering against all this very dry season which we have had—not as strong as usual, but good.

Mr. PATTISON: Would there not be a great difficulty on many soils, especially in a dry time, in getting the clover to start at all at that date? It seems to me the main difficulty of that system is that there are many soils in our neighborhood where it would be impossible to get clover to take then, except in a very exceptional season.

Mr. POWELL: I would answer that in this way: If you keep your soil under the thorough tillage which I have already outlined, you have retained sufficient moisture in your sub-soil, unless the drouth is extremely prolonged and severe, so that you will really get a very fair start of that plan even in a dry time. Of course, if you could get just one shower to start off the plant, it would strike its roots down into that moist soil, and then you would be certain of a good stand. The danger would be along in July—if you would sow as early as that—of a dry condition of soil that would fail to germinate your seed.

A MEMBER: What do you do immediately after the sowing?

Mr. POWELL: When you finish your last cultivation sow the seed, then run it over with the cultivator and cover the seed very little. That keeps it down, and if there is any moisture, the roots will strike right down.

Mr. McNEILL: There is another reason for plowing that early, before there is any spring growth. About corn-planting time I had an enormous growth of crop just coming out in bloom. That was plowed down, and it formed a perfect mat and broke up the communication between the sub water and the top of the soil, although I had the top soil in excellent culture; the corn that was sown remained there for weeks, just as if it was in the crib, until the rains came. Had that fine soil been in communication with the sub-soil water by a comparatively firm soil, the corn would have grown immediately—there would have been sufficient water thrown up from the sub-soil, in which there was plenty of water, to have germinated the corn.

Mr. TWEEDLE, of Winona: What soil is yours, Mr. Powell?

Mr. POWELL: It is what would be called a gravel loam; it is not a sandy

loam—just between a sandy loam and a shale. It is not a shale, but it is a gravel loam inclined to a sandstone sub-soil.

Mr. TWEEDLE: How would that compare with a clay soil?

Mr. POWELL: The clay soil would be the heavier, and I think the crimson clover is not so congenial to the clay soils as to our heavier loams; and if you have clay it is a question whether the peas would not be better than clover.

Mr. CASTON: How do the cow peas compare with the clover as a nitrogen crop?

Mr. POWELL: They are very good. I like the crimson clover because of the large amount of humus it puts back in the soil. Your peas do not give you quite as large an amount, but as a nitrogen gatherer it is equally as good.

Mr. PATTISON: How would some heavy straw-growing varieties of the ordinary field peas do? They attract a great deal of nitrogen.

Mr. POWELL: I should think where you could grow them they would very suitable indeed for your heavier soils.

A MEMBER: Would you recommend such tillage for all kinds of fruit trees?

Mr. POWELL: Yes, I think I would make no exception whatever, even to the peach, which is more susceptible to tillage than almost any other tree. I would recommend the same tillage for the peach although in a peach orchard I would withhold somewhat the clover; although I want to say right here that I have had the crimson clover for six continuous years in the peach orchard, and that peach orchard to-day is in the very finest condition of health of any trees that I know. In the peach districts of Delaware and Maryland they would not dare to sow crimson clover as I am sowing it in New York state, but I am experimenting with this orchard to see how far the crimson clover culture can be carried, and although last year the buds were frozen mostly, still the growth of wood was excellent and no trees were frozen where for six years the crimson clover had been plowed in around those peach trees.

Prof. MACOUN: I would like to describe our system of tillage at the Experimental Farm. It is a little peculiar on account of the character of the soil. I think we are getting very good results from that system. The soil is a very light sandy loam, in fact it might almost be called barren in parts, and my purpose is to try and get as much humus as I can in as short a time as possible, because I think it is very important to have it there, and we are adopting a little different system from what is generally advocated. Supposing you have a cover crop of clover in the winter—and I may say we use common red clover with great success—we plow that under in the spring and re-seed immediately with clover. That clover is allowed to grow through the season, and it is cut at intervals. It is cut all the next season—that is, it is cut for two summers. The second season I have had in four weeks of that clover 25 tons of green clover lying in the orchard from four cuttings. The clover reached a height of 18 to 20 inches before each cutting. I cut it just before it came into bloom, and the result is that we have a moist and decayed vegetable matter lying on the surface of the soil; we have a gradually-accumulating mass of humus just below the surface of the soil, and I have found the orchard not to suffer in the least degree from the lack of moisture. I would not advocate this system on any other kind of soil than we have there. Although the soil is very sandy it seems to contain a quantity of moisture, and I think that we are really warming the soil by this clover treatment. Of course the second winter the clover dies, but we plow it under in the spring and re-seed it.

The CHAIRMAN: You do not take the clover off the soil; you just cut it and leave it on the ground?

Prof. MACOUN: Just cut it and leave it on the ground.

J. D. SERVOS: Suppose the soil of an orchard is in excellent state of cultivation, would you recommend sowing the orchard to Hungarian grass and at the same time seeding it with lucerne and afterwards cutting the Hungarian and pasturing it with pigs for a number of years?

Mr. POWELL: I should hesitate to put in a crop like Hungarian grass in an orchard that is thriving, growing and producing good crops of fruit. I think there would be danger, although the very fact that your orchard is thrifty is the evidence that it is now in excellent condition. I would not interfere with that by putting in any crop like Hungarian grass. I think that you might find the danger of checking the thrifty, excellent condition, especially if you should be followed by severe, dry weather with that crop of Hungarian grass; I think you would give your orchard perhaps a very serious check, and I would not like to risk a thing like that.

MR. SERVOS: What do you say about lucerne, and pasturing the orchard with pigs afterwards?

Mr. POWELL: That would be making the same draft on your soil that the Hungarian would.

Mr. SERVOS: The reason for using the Hungarian grass is to make a proper catch for the lucerne. I found this year that in sowing in that way I did have a full catch of the lucerne, while heretofore it seems to have been not a success. I have just come to this county this year, and I tried that for the first time in my experience, but I have made a good catch with lucerne, and the pigs are enjoying it just at the present time. It is growing now, even in this climate.

Mr. McNEILL: I am afraid you will find the pigs will ruin your lucerne; they will take the crown right out of it.

Mr. SERVOS: Did you treat the pears with the same treatment of clover culture?

Mr. POWELL: Yes, the pears were grown under that same system. Apples, peaches, plums, cherries, in fact everything that is cultivated is put under this system. Potatoes and corn, and even the garden is all kept under this system of clover treatment.

Mr. PATTISON: Do you not find that there is any tendency to produce blight in certain varieties of pears, cultivating at all?

Mr. POWELL: No, they have been entirely free from that.

Mr. SERVOS: After getting your land in that state of cultivation would you advocate growing a root crop?

Mr. POWELL: In a young orchard first planted, if you will feed each crop that is taken off, it is admissible to put in small fruits such as strawberries or raspberries or currants, which is my practice, growing those small fruits in all those newly-planted orchards, but each crop is fed independently while it is growing. The same can be done with corn and potatoes, provided that each crop you put in you feed independently of the trees. That keeps up your culture, and you get some production from the soil; but it would be ruinous to attempt to crop a young orchard unless you fed each crop that is taken off it.

Mr. PETTIT: In reference to the crimson clover, you said down farther south it would not be wise with peaches—in Delaware. Why?

Mr. POWELL: For the reason that they think there is too much incorporation of nitrogen in the soil; that it makes too much growth of wood and danger of winter-killing their trees and their fruit-buds. That is the reason they do not dare to sow continually in Maryland and Delaware. Too much nitrogen induces too succulent a growth of wood, it being a warmer climate. I presume they get a larger elimination of nitrogen than we get in this colder climate. I presume they do not like nitrogen so much as they do phosphoric acid and potash in those states of Maryland and Delaware.

Mr. HUGGARD: Have you found any effectual remedy against pear blight,

and has manure and cultivation a tendency to increase pear blight or otherwise ?

Mr. POWELL : I have never suffered from pear blight from cultivation or high manuring. I want to state to you frankly this afternoon that my pear orchard stands to-day absolutely ruined, but it is from an insect, not from high culture or high feeding. The last good crop of pears I had was ten years ago, which was 1,200 barrels. Prior to that crop the soil was heavily top-dressed with stable manure fed from steer feeding, the ration composed of wheat, bran, cornmeal and linseed meal, the manure drawn directly from the stable to this pear orchard and spread heavily upon the surface. In addition to that, a half ton of fertilizer per acre was used in the spring. That is applied early and plowed in lightly and the ground harrowed. That season this crop of fruit was produced which would barrel over 90 per cent. of No. 1 fruit. The trees were in the most thrifty condition. There was not the first evidence of any blight anywhere in the orchard. The following season there came the blight over the orchard, and it was very generally charged that I had over-manured and over-cultivated that orchard. But it was not pear blight. It was the first visitation of the pear Psylla, and I hope if you have not got it you will never get it in this beautiful country. It is the most disastrous thing that ever struck my business.

The CHAIRMAN : We have it.

Mr. POWELL : I am very sorry to hear it. Out of 2,000 trees I have lost 700 to-day, in spite of all I could do to keep down the ravages ; 700 beautiful trees to-day are dead and gone, and will have to be cleared from the soil. Now, that has been a visitation of this insect, but there has been no evidence of blight whatever owing to this high culture. No evidence of blight has made its appearance in my orchards ; so that I have proved in my own experience that with my soil, with my conditions, with high tillage and high manuring, it has not produced pear blight for a moment. I am thoroughly convinced of that.

DELEGATE : What insect is that ?

Mr. POWELL : The pear Psylla is so minute that you cannot discover it with the naked eye at first. It works at the axils of your leaves and at the stems of the fruit, sucking out the sap, exuding from their bodies the substance known as honey-dew, which gradually settles down over the branches of your trees, after which a fungus attacks your trees, turns them black, stops the growth of the tree, stops the development of fruit, and ruins it. And it is the most persistent thing I have ever had to meet in my business, and I am at the point to-day of clearing my entire ground of pear orchards ; I have almost reached that point.

The CHAIRMAN : Has the kerosene emulsion not been sufficient ?

Mr. POWELL : It is very difficult to reach it. I have sprayed on the first appearance, persistently sprayed, and we cannot get it down. I have been advised by our entomologist not to give up, but I think ten years is a pretty long fight. I confess I am getting discouraged. This past ten or twelve days I have undertaken to give it winter treatment. I went out with my kerosene barrel into the orchard on pleasant sunny days when the Psylla are out. They are little flies now, and you will see them crawling up and down the bodies and branches of the trees. I undertook to control this pest by the advice of the entomologist of Cornell University, with winter treatment. We sprayed with five per cent. kerosene and it had no effect on them. Then we used ten per cent. kerosene and no effect followed. We used 15 per cent., and the Psylla would crawl right out unharmed. We added 20 per cent. and I think killed a few ; and when we put it 25 per cent. we killed all we hit. The next day we sprayed one entire orchard, and there just as many live ones on as there were the day before.

Mr. SERVOS : Returning to the crimson clover, are we to understand that treatment is annual ?

Mr. POWELL : Annual treatment. That is why I like the crimson for me, because being an annual it grows very rapidly after it germinates, so I get a

handsome cover for the soil during the winter months. The red clover being a biennial, we cannot get so good a crop of cover as we do with the crimson.

The CHAIRMAN: Does the crimson go right through winter?

Mr. POWELL? Yes.

Mr. TWEEDLE: Sown in July?

Mr. POWELL: Yes, sown about the middle of July.

Mr. BOULTER: What is your object in sowing so late?

Mr. POWELL: We want to keep up the cultivation of our orchard till as late as possible.

Mr. BOULTER: Do you sow anything but the clover?

Mr. POWELL: No, not with me. If it be necessary to have a nourish plant with it I would put oats or rye by all means.

Mr. MCNEILL: That would be too early for crops. If we quit cultivating any crops in July they haven't the quality.

Mr. POWELL: You would have to cultivate crops up till middle of August. This year I sowed even to the middle of September, and have a very good crop to-day.

Mr. MCNEILL: It is a splendid crop to put in after strawberries.

Mr. POWELL: Yes, very fine.

Mr. GEO. E. FISHER: In regard to the pear tree Psylla, in response to an invitation last year I visited the large orchards of Mr. Latch's, at Youngstown, in New York State. He took me to a very large block of dwarf Duchess pears that he said he had expected to lose from an attack of the pear tree Psylla. The trees were dropping with honey-dew. The foliage was sticky all over, and the fruit was covered with the honey-dew. The trees themselves had become blackened with the fungus which always develops where this honey-dew is abundant, and he had given up this orchard expecting to lose it. He said it was a very profitable orchard, and he felt it was a great loss not to be able to retain it. However, he said he had heard of the advantages of lime, and in February, 1897, he gave his orchard a thorough spraying with lime. He had no formula. He used all the lime that his nozzle would draw. He put all the lime on the trees that he could make stick. He applied it only once, and he cleaned his orchard entirely. When I saw this orchard in May it was bristling with fruit buds. The trees were the very picture of health. There was nothing about the trees at that time—of course there was no foliage—to indicate weakness or disease in any form. Now I would like to ask what time you plow this crimson clover down? How much a growth you obtain at the time it is plowed in, and when you sow? And then do you expect to gather nitrogen by it?

Mr. POWELL: In 1898 I had a growth of fourteen inches of crimson clover on the 1st of December, sown the 20th July among corn bushes; and in this pear orchard and in apple orchards the clover measured a height of fourteen inches. That which was sown later, in August, made a growth of from six to eight inches. Now, this is plowed in in the spring just as soon as the soil gets dry enough to go upon it and work it; and I will say here that you can plow your land that is covered with crimson clover at least one week earlier than you can naked land. It puts the season ahead for working at least one whole week, and I look upon that as a very important thing, because we must count and base our calculations more and more upon seasons of drouth. I do not know why, but it is becoming the rule of late years to run into severe drouthy periods, and I think as fruit growers we need to recognize that fact and prepare for it, and plan for it. Just as quickly as we can stir our orchard soil in the spring, by so much are we going to avert the damages from drouth, because we hold back the subsoil and water just as quick as we can stir that ground and can begin to work over its surface. One week will lose for us hundreds of tons of water in the spring by not stirring the ground. Evaporation begins and goes on so rapidly that it is of the utmost

importance that we get into our orchards early in the spring and plow and conserve its moisture. So I plow one week earlier by having this cover on the ground than I could without it. In regard to rye that will only add humus. It will add no nitrogen whatever to any soil. It has no power whatever to do that.

Mr. McNEILL: Except indirectly; it will certainly make the nitrogen which would be in the soil more available.

Mr. POWELL: It will from the fact of its making humus in the soil, but in itself it is not fitted to add nitrogen.

Mr. SERVOS: How deeply do you plow your clover?

Mr. POWELL: Only about six inches.

Mr. PETTIT: One difficulty may arise with our soils here in regard to that treatment. Our heavier lands, with a mass of clover and deep fall of snow, might suffer severely from mice on the unthrifty growing trees.

Mr. McNEILL: Yes, there would be certain seasons where they would suffer from mice. For three or four years we have a regular migration of mice.

Mr. WHITNEY: I do not understand plowing six inches deep during the tillage. Suppose I make up my mind to try your plan in a pear orchard that has been left in grass, it will not do for me to plow six inches deep.

Mr. POWELL: No. If you are going to take up an orchard that has been in grass for years you ought only to cut and tear that sward to pieces, because your roots are clean to the surface. They have to get their most available plant food near the surface. Now simply cut and break your sward, then put on your tooth harrows and tear it all to pieces; but it would not be at all safe to put your plow right over and plow to that depth. The more you cultivate the orchard the more you send the roots down.

Mr. CASTON: Prof. Craig, formerly of Ottawa, now of Iowa, exhibited a chart at this Association giving results of clover at Ottawa. He showed that crimson clover was a better nitrogen trap than any crop he had tried, including the ordinary red clover and the Lucerne. He showed the crimson clover had a greater proportion of nitrogen, but unfortunately for a large tract of this Province, it will not live over winter; it dies quite early in the winter, even under the most favorable conditions. I would like to ask about these cow peas. I see by the bulletins that we get from the other side that they are highly thought of. How much do you sow to the acre, and about what do they cost?

Mr. POWELL: I tried my first experiment with cow peas this year. I wanted to know the comparative value of cow peas with crimson clover, because I met in so many places the question that you raise here—that the crimson clover is not adapted to your locality so well. I sowed the cow peas at the rate of one bushel to the acre broadcast, and harrowed them in. They cost me, I think, $1.90 a bushel. They made a very fine growth, although the season was a very dry one. They grew to the height of about 20 inches this year. The first frost cut them down, and they make a fairly good covering, although not equal to the crimson clover as covering for the winter.

A MEMBER: I would like the speaker to tell us why our Flemish Beauty pears blight and scab so much here, while most of our pears in Ontario go on well. Not one year in ten can we get any Flemish Beauty.

Mr. POWELL: The Flemish Beauty is particularly subject to the attack of the pear scab fungus. There is a difference in varieties. The Baldwin apple and the Fameuse are the same—more subject to the apple scab fungus than some other varieties. So it lies in the variety itself. It is not able to resist the attacks, and hence it goes down under that attack.

Mr. SERVOS: There is no remedy that you know of?

Mr. POWELL: The only remedy I know of is Bordeaux Mixture, and in many sections it does control it very largely. In some sections it does not. But Bordeaux mixture applied very thoroughly and persistently early in the season,

before the buds open at all, and followed up, will in many instances very thoroughly control that scab upon the Flemish Beauty pear. I have seen beautiful specimens grown by four or five sprayings of Bordeaux mixture upon the Flemish Beauty tree. The Baldwin is quite subject to scab. The foliage of the Baldwin is very defective with us in New York State.

Mr. SERVOS: The Baldwin grows better with us than it does with you.

Mr. POWELL: Yes, it does.

Mr. PETTIT: Have you any trouble with the Bitter Rot on the fruit itself?

Mr. POWELL: The Bitter Rot is extending quite seriously in New York State. It is a fungus trouble that takes the fruit early in the season. The fungus spore strikes the fruit and it develops just under the skin, and you have what is known as the Bitter Rot, which ruins the fruit for market or for use; and I think it is owing to the general decline of the Baldwin apple, and I think that general decline comes from the fact that its foliage is weak, that it is not a strong resisting foliage, and I think the Baldwin apple is failing because its foliage is tenderer and not highly resistant to fungus attack. For that reason I am planting to-day the Sutton Beauty apple, which is similar to the Baldwin in appearance, but the foliage of which is like that of an oak tree; it stands right up against the apple scab fungus, and I think we can grow Sutton Beauty in as prolific quantity as we used to grow the Baldwin apple.

Mr. MCNEILL: Mr. Morris could probably give us some very good information as to how the Sutton Beauty suits our local conditions here.

Mr. MORRIS: I would say that it does well with us, and while we have grown the trees a good many years I have been surprised there has not been a larger demand for it. I look upon it as every way a first-class apple. The quality is better than the Baldwin; in fact, the quality is first class. I would like to speak on the apple that I brought here as a long keeper. I have noticed in this apple a tendency to stick on the tree late in the fall. This year I let it remain on the tree to see how long it would remain. About a week ago I had them gathered. At that time about half the crop was on the tree and the other half on the ground, but all sound, while everything else in the sample orchard, all kinds, perhaps nearly three or four hundred varieties that fruited, had rotted or disappeared one way or the other—even the American Pippin, that will keep with us from January to June. This is an apple that was sent to us by the late Charles Dalby, and it is called the Horn.

G. Y. SMITH: Is it not too small for shipping?

Mr. MORRIS: It will keep until next spring.

Mr. SERVOS: Is that a fair sample as to the size?

Mr. MORRIS: It will grow larger. The trees require pretty strong soil. We have no trees for sale, and we would not grow them for a dollar a tree.

DELEGATE: They are too small.

Mr. MORRIS: I intend to graft a number of trees with them any way.

Mr. FARWELL: You want to get a force pump inside and force them out. (Laughter.)

Mr. MCNEILL: They are large enough for a dessert apple.

Mr. MORRIS: I am afraid we are missing the most important points in the address we have had—that is, the individuality of trees and the importance of top-grafting. I believe every word the speaker has said as to the top-grafting of trees, and particularly the King on the Northern Spy. There are good reasons to be given why that is a good tree to top-graft on with the King. He did not mention it, although he is well posted on it. First of all, the wood is entirely different. The Northern Spy wood is hard and fine grained; the King wood is coarse grain, and does not make the union as complete; I mean it does not unite so but what there will always be a certain amount of check to the flow of sap there. That is really what makes it bear. Then there is another thing: the roots of th

Northern Spy grow downwards, while the King roots are few and they spread out and run near the surface. There is a great deal of value in getting the roots thoroughly established downwards first. The great point about top-grafting is this: where that graft is put in on the top it checks the flow of sap, and will throw that tree into productiveness.

Mr. McNEILL: Put a wire tight around it.

Mr. MORRIS: I was going to speak about that. That is where you can get your individuality—by doing anything that will check the flow of sap. If it is unproductive you can wind a little wire around it. The next year it will bind the bark on that. The next year you will have a good crop of fruit.

Mr. SMITH: Kill the tree.

Mr. MORRIS: No, it will not; that wire will cut into the bark and it will grow right over it.

Mr. BOULTER: Where would you put that wire?

Mr. MORRIS: Anywhere. It is well known that grape growers to go through the process of ringing their vines for show fruit. Most of you know something about that. In the Toronto Exhibition there is fruit that has been ringed. The The fruit is larger, and will ripen perhaps eight or ten days earlier, but has not got the flavor. The process of ringing is just taking and ringing the bark right out of the branch of the grapes. Now, this individuality may come in this way; there may be some defect about the stem of the tree. Even a little bark at the bottom that you would not notice will check the flow of sap and throw that tree into productiveness. I cannot come to think that, taking a lot of trees together, one will have sense enough to be productive and grow a particular shape, and others not, unless there is some cause for it. I believe that plants and trees do almost have sense. Anybody that is amongst them all the time and studies them can notice their pecularities, and cannot help coming to the conclusion that they do know something. (Laughter.) You take a climbing vine that will start, and it will feel around for something to climb on, and perhaps it will get hold of something and climb up quite a distance; but that thing, whatever it is, may not be congenial to it, and it will unwind itself from that again and feel for something else and go up that. Or you may take a tree of any kind, and if there is a pile of fertilizer some distance from it the roots will go in the direction of the fertilizer. Take a willow and plant it on a dry piece of ground. Of course we all know willows like moisture. If there is a water pond or well or cistern or anything that way, the root will start for that moisture, and it will get there. Now, when we know and understand all this, we cannot help but think that plants do know something; but still I do not think plants will know so much as to assume certain shapes unless there is some cause for it.

Mr. McNEILL: I think my friend, Mr. Morris, agrees strictly with the lecturer on that, after all, because you will be perfectly willing to admit that those fine horses that you feed so nicely there would breed a better class of horses next time, because they were fed so well this time, and therefore you would rather breed from them than from the scrubs your neighbor has.

Mr. MORRIS: Certainly I agree with him in what he says about feeding and cultivation.

THE PROFITS OF AN APPLE ORCHARD PROPERLY SPRAYED.

By E. B. Edwards, Q.C., Peterboro.

I am not a farmer and I am not a fruit grower in the same sense that many of you are here. I am not an exporter of fruit in the sense that many of you are here, and I don't pretend to know half of what a great many of you know. I can only give a little bit of my own experience in spraying in the hope that it may be of some use, and in the hope that it will not go any further if it is not Some eight or ten years ago the late Mr. Dempsey visited Peterboro, in connection with one of the farmers' institute meetings, and I got my first light on spraying. The course that the Government have taken in enlightening the people in this Province upon the facts of spraying in a practical way have been of the greatest use, and they have solved the problem of helping the people in their development to an extent that they perhaps do not receive full credit for—(Hear, hear). I think they should receive full credit for it, and their efforts should be backed up by those here who know the benefit of spraying, in order that those who do not know it so well get the benefit of it and that it may spread through our country. (Hear, hear). I think we may deduce as a general proposition this result: that an orchard properly sprayed will have its value increased at least fifty per cent. over another orchard that is not sprayed. That is an average in all seasons and all through, probably in many cases—I found it so in my own case—the average will be much greater. The value has been doubled, I am satisfied, in many cases in the small orchard I have had charge of; and I believe that one is quite safe in putting it that the average increase in value would be at least fifty per cent. If you apply that to what is going on in this country, the development that is taken place in the productiveness as far as our orchards are concerned is something that is not perhaps tabulated to the full extent that our other crops are tabulated. The value of the orchard to Ontario is something that we have not yet, I think, quite figured up, and the value that is possible to be obtained in Ontario from the extension of the growth of orchards and the best production from the orchards in this country is something that we cannot measure. We are only at the beginning of it, and it is for the people and the Government of the country to see that everything is done to help the upward tendency in that direction, and to see that when people are setting out and going into orchard growing they are doing it on right lines. This Association is doing its work splendidly, and the help that is being given by the Government, through the desire that the Government seems to have in helping on this good work, I think is much to be commended. A few years ago I had the first information given to me by the late Mr. Dempsey on spraying. It came to me as a sort of revelation. I had taken hold of an orchard that my father had planted years ago, and that had been a very good one in its way, of some five acres, and I found when I took hold of it that the apples were small, especially in the Fameuse, and very scabby, and in very many other varieties, nearly all of them, they were worn-eaten. It was almost impossible to get a perfect apple out, and in attempting to ship away a few barrels I found it required three or four barrels to be turned out on the table to get one barrel that was decent at all. That seem to me very unsatisfactory, and it was after this I got the information from Mr. Dempsey and began spraying. I found the increase in the quantity of good apples to be so great that it surprised me beyond my expectations; and I found after a little that I could venture on the shipment of apples to the Old Country, and was very agreeably surprised that, instead of having to turn out three or four barrels for one barrel, I could get out for about half. I thought that was very well. I went on spraying, and I found I got a large percentage; and I think in my own experience it has doubled the productiveness of the

orchard in good fruit. Take for instance a year ago. In 1898, when other orchards in the neighorhood had not good crops, I found I had a first-rate crop of apples. On a single variety of some 22 trees I had some 66 barrels, which turned out about 50 barrels of first-class apples and netted me in Peterboro about $3 a barrel. I thought that was very good, when the culls out of them netted from $2.25 to $2.50. It was rather an exceptional year and rather an exceptional circumstance, to get a good crop where other people had a poor crop, and get them clean and good. But whether the crop is large or small the result is the same in proportion —that you get so much larger a proportion of good fruit that it is an easy thing to see that you attain the result of increasing your crop at least 50 per cent.; and if you apply that to all the orchards of the country the gain on the average through the country is something that is almost impossible to figure up. I look upon it, therefore, that although I cannot give you much experience here, nor say much about it, I have responded to the call made upon me to say from my point of view—coming from the back country district where there is not much fruit grown, and where experience of others, as well as myself, has been limited—that I am fully convinced that the spraying is the greatest thing that can be done by orchard growers of the country to increase the quantity and the productiveness and the value of their orchards.

The CHAIRMAN : One item was passed over this morning, the introduction of representatives of other horticultural societies.

Mr. W. C. REID, President Belleville Horticultural Society, said : I would just say that in Belleville our society is in very good condition, and everything is going along favorably. I came here for information rather than to give any and we are in harmony with the Fruit Growers' Association. We have a membership of between 60 and 70, and have decided to continue as a branch of the Fruit Growers' Association of Ontario.

REPORT OF THE COMMITTEE ON NEW AND SEEDLING FRUITS.

BY PROF. H. L. HUTT, O.A.C., GUELPH.

It is usually in seasons when the fruit crop is abundant that the greatest number of new fruits is brought to light. During the past season the fruit crop has not as a rule been a heavy one, nor have many new fruits been brought to the notice of your committee. In fact fewer samples of seedling fruits have been received this year than for several years past. Among these few, however, there are one or two especially worthy of mention, which will in time, no doubt, take a place on the list of standard varieties.

In the table below we give a brief notice of what has been sent in. Those deserving of special mention are marked with a star, and are described more fully in the paragraph descriptions which follow.

SENDER.	REMARKS.
Seedling Apples.	
J. D. Marsh, Mille Roches, Ont............	Something like a highly colored Greening med. size; fair quality, but not superior to Rhode Island Greening.
Jas. W. Grady, Annan, Ont.	An apple very similar to, if not identical with, Yellow Bellflower.
*J. P. Williams, Bloomfield, Ont	A handsome winter apple, said to be a seedling of the Belmont; promising.
J. P. Cockburn, Gravenhurst, Ont.	"Minto"; a hardy Muskoka seedling; med. size; green and dull red; fair quality; but hardly worthy of propagation.
Wm. Mowbray, Sarnia, Ont........	Med. size, yellow splashed with light and dark red; quality fair; but flesh too coarse grained to make it valuable.

SENDER.	REMARKS.
Seedling Pears.	
R L. Huggard, Whitby, Ont................	Large ; obtuse pyriform ; yellow with red cheek ; flesh tender and juicy, with some granules ; quality good ; season Nov.
*Miss Lillian A. Trotter, Owen Sound, Ont..	Seedling raised by the late Mr. Trotter. Below med. size ; yellow with pink tinge on sunny side ; flesh buttery, and of good quality ; promising.
Seedling Plums.	
*E. D. Smith, Winona, Ont..................	The "Emerald"; handsome ; greenish yellow ; like a small Washington ; quality excellent ; very early, ripening about Aug. 1st.
*F. R. Latchford, Ottawa, Ont	Like Englebert ; med. size ; blue ; fair quality ; said to be very hardy and productive.
Seedling Peaches.	
*E. D. Smith, Winona, Ont..................	The "Millionaire" peach ; large and handsome ; resembling Early Crawford ; yellow flesh ; freestone ; excellent quality ; season of Late Crawford.
R. T. Smith, Hamilton, Ont..................	Samples of this peach were also received and reported on last year. Fruit large ; white fleshed ; red cheek ; good quality ; season Aug. 15th to 25th.
Seedling Grape.	
*John Charlton & Sons, Rochester, N.Y.....	The "Charlton"; a cross between Mills and Brighton ; bunch and berry large ; color light red turning to moroon ; quality excellent ; promising.

Seedling Apple. Received in May from J. P. Williams, of Bloomfield, Prince Edward Co., Ont. Said to be a seedling of the Belmont, or Waxen apple. Mr. Williams says the tree is hardy and very prolific ; begins bearing at an early age. The fruit is of good size and handsome appearance, having a bright red cheek which should help it to sell in an old country market.

Seedling Pear. From Miss Lillian Trotter, Owen Sound, Ont., grown from seed by the late Richard Trotter. Tree said to be healthy and a rapid grower. Fruited for the first time in 1898 ; a fair crop this year. Fruit below medium size, obovate, obtuse pyriform ; skin yellow, with bright pink tinge on the sunny side ; numerous small brown dots ; stock medium length, stout ; cavity rather broad, very shallow ; basin narrow, shallow ; calyx open ; flesh yellowish, moderately juicy, buttery, sweet, high flavor. Quality very good. Promising.

The "Emerald" Plum. Received from E. D. Smith, Winona, Ont., Aug. 1st. The accompanying engraving, and the following description of this promising plum appeared in the September number of the *Horticulturist.*

"So long ago as the year 1889, the late Warren Holton, of Hamilton, well known in fruit-growing circles, sent us a sample of a new seedling plum, which he called "Early Green." In an accompanying note he said, 'considering its size, fair quality, and in particular its early season (1st August) in ripening, I think it may prove worthy of cultivation.' About August 1st, 1899, ten years later, we received another sample of this plum under the name of Emerald, which we had little difficulty in identifying as the same. The accompanying engraving shows the plum in natural size ; the color is greenish yellow, form roundish, of good size and excellent quality ; coming in before the better varieties of Japan plums, and not being subject to rot, this plum will no doubt be of considerable value."

Seedling Plum.—From Hon. F. R. Latchford, Ottawa, Ont. The accompanying engraving of this plum appeared in the July number of *The Horticulturist,* where Mr. Latchford speaks of it as follows :

"A blue plum in my garden here is remarkable for its hardiness and productiveness. It most closely resembles the variety "Prince Englebert." The tree is said to have been planted about 25 years ago, and to be the only one of a number purchased at the same time which has lived. The trunk divides in three

parts almost at the ground, where it has a diameter of about 15 inches. It is absolutely hardy, and yields enormously about every second year. In 1898 I

THE EMERALD PLUM (natural size).

gathered from it 440 pounds of fruit. At least 60 pounds more fell owing to the wind, or with branches which could not be propped. The size of the fruit is

medium to large, and the quality good. The variety seems a desirable one to propagate, especially in the East; and I shall be glad to give scions for budding, at the proper time, to all who may desire them. Our engraving shows a terminal cluster of the fruit."

The "Millionaire" Peach.—From E. D. Smith, Winona, Ont. Mr. Woolverton gives the following account of this peach in the October number of *The Horticulturist*:—

"We are in receipt of a very beautiful sample of peach to-day from Mr. E. D. Smith (Sept. 12th), which well deserves notice, providing the tree is hardy and productive and the fruit should average anything like this specimen. It very much re-

A SEEDLING PLUM

sembles a fine sample of Early Crawford, but the form is rounder, the cavity and suture deeper, and cheek a darker red. The flesh is a beautiful yellow, of tender texture, juicy and highly flavored, quite equal to that of the Early Crawford, while the pit is smaller. Coming in at the season of the late Crawford, it has no competitor that we know of unless it be the Wonderful, which is also of about the same season. It precedes Elberta, apparently, by about a week."

The Charlton Grape.—From John Charlton & Sons, Rochester, N.Y. Mr. Woolverton has also noted this promising new grape in the October number of the *Horticulturist* as follows:

"We have received to-day (September 27th) three bunches of the new

Charlton grape. Messrs. John Charlton & Sons, of Rochester, the introducers, say, 'We send you a sample of our new grape which we allow to speak for itself'; and certainly if the vine is healthy and productive the qualities of the fruit are such as to ensure it a place among our very best varieties. A cross between Mills (Muscat Hamburg x Creveling) and Brighton, (Concord x Diana) two varieties themselves possessing most excellent qualities, we would expect nothing less than a first-class hybrid. The bunch is large, about five and a half inches in length, shouldered and very compact. The berry is large, skin tough, light red turning dark maroon and almost black at maturity; covered with a thin lilac bloom; flesh meaty, tender, pulp breaks up readily from seeds; flavor sweet, fairly juicy, sprightly, aromatic, very pleasant."

WELCOME BY MAYOR RUTLEDGE.

The Mayor cordially welcomed the Association, and said: I know of no Society in this country the aims and objects of which are of such universal application to all classes of the community. They seems to affect everybody. There is scarcely anybody in this country that has not a little ground to cultivate Some have an acre, some ten, some a hundred, but the objects of your Association affect every man who has a bushel of apples or any quantity of first class fruit to sell; and I feel that your Association is doing a most wonderful work for the people of this country in instructing them in the mode of turning the result of their labor into cash. A man is going to plant trees, and your Association will tell him what kind to plant, and what soil to plant them in; how to treat them after they are planted; the enemies that are liable to attack them from the moment they are planted as long as they are alive; the enemies that are going to attack the fruit from its inception to maturity, and how these enemies can be destroyed or their effects neutralized; so that those who attempt to grow fruit may be enabled to grow first-class fruit. Then your Association deals with the question, what to do with this fruit when it is grown; how it is possible to take fruit and place it on the European market in about the same plight and condition as when it left the hands of the producer. When you have accomplished that, I submit that you have opened a mine of wealth in this country to every man who wishes to avail himself of the opportunities. The question of sending fruit to the English market in a sound and satisfactory condition will be solved on scientific and practical principles, and in a very short time. When these questions are pressing on the people they will be solved by scientific and practical men; and I am very glad to see that your Association produces a very large number of such men. I have been comparing your magazine, the *Canadian Horticulturist*, as it appears to day with the production of ten or twelve years ago, and have been struck with the remarkable progress you have made in this publication, which to-day is beautifully printed and illustrated, and the mechanism and everything about it is first-class. It is a credit to your Association and to the country, and reflects the highest credit upon the editor. (Applause). There is scarcely one subject that any fruit-grower is in difficulty with, or wants to get information on, but if he is a careful reader of that journal he will find the very information he wants, written by practical and scientific men. I submit it is a publication of the highest importance to everybody, and the cost of it is next to nothing. One article in it on any subject on which a man wishes information is worth more than the price of the magazine for the year, and I trust that every fruit-grower in this section will be a subscriber to the *Canadian Horticulturist*. I will not detain you any longer. I again thank you, and trust that in the near future you will again be in a position to honor us with another meeting of your association. Applause).

The CHAIRMAN: On behalf of the Ontario Fruit Growers' Association I tender you our sincere thanks for the kind words you have spoken, Mr. Mayor, and the hearty welcome you have given us to your town. It is evident from the large number here this evening that you take an active interest in this work. The men who laid the foundation of our Association over thiry years ago laid it wisely and well. Although it was securely laid, it has proved to be a very moveable institution. To this fact, and the earnest efforts of your Mr. Huggard, we have to give the account for the pleasure of being with you this evening. Many of the members of our Association are largely engaged in fruit growing. Their constant effort is to secure the best varieties of fruit and to grow it to the greatest degree of perfection possible. We have made fair progress in this direction, but our customers say that some of us have not succeeded so well in in packing. Now, we are here to receive all the information that your local growers will give us, and we will be pleased to give any information that we can in regard to fruit or fruit growing, and do anything we can to advance the interests of horticulture and floriculture.

REPORT OF THE EXECUTIVE COMMITTEE.

The past year has been one of considerable progress on the part of our Association. The membership has increased about 400, and the number of affiliated societies now on our list is 42. The members of these societies are mostly amateur flower growers, as well as fruit growers, and ask that some attention to floriculture be given in the journal. With this in view, an addition of eight pages has been made to the *Canadian Horticulturist*, and much information given on this subject. These societies contribute materially to our strength, and give us a large field of usefulness. One of the strongest of these societies is the one at Hamilton, which is increasing in numbers every year.

The following lecturers were sent out to these societies in the spring of 1899:

Prof. Macoun, of Ottawa, to Brockville, Cardinal, Iroquois, Smith's Falls, Carleton Place, Arnprior and Kemptville.

Dr. Jas. Fletcher, of Ottawa, to Napanee, Brampton, Oakville, Hamilton and St. Catharines.

Alex. McNeill, of Walkerville, to Woodstock, Paris, Waterloo, Seaforth, Kincardine, Durham, Owen Sound, Orangeville, Meaford, Thornbury, Orillia, Midland and Burlington.

M. Burrell, of St. Catharines, to Lindsay, Campbellford, Stirling, Picton, Trenton, Cobourg, Port Hope, Millbrook, Niagara Falls, Port Colborne, Hagersville, Port Dover, Simcoe, Leamington, Windsor, Chatham and Grimsby.

These societies have reported their appreciation of the addresses given.

By-laws were prepared for the uniform guidance of these societies by Messrs. Thos. Beall and L. Woolverton, and copies sent to each society. These by-laws have been included in the report for 1898.

Your Executive have endeavored to use the power you have entrusted them with in the wisest possible manner.

The committees on transportation and freight rates were called together frequently, and the resolutions adopted were duly forwarded to the Minister of Agriculture at Ottawa, and resulted in securing for us the requests therein made, which are printed in their report.

Much public scandal against fruit shippers being caused by the 6,500 barrels of fraudulently packed fruit on board the SS. "Castilian," wrecked off Yarmouth,

N.S., your Executive prepared the following resolution, addressed to the Minister of Agriculture :

"Whereas, it is well known that fraudulent packing of apples is a very prevalent evil which is yearly bringing discredit upon the name of our Dominion, and ruining the English markets for our Canadian apples ;

Whereas, as a matter of fact, Canadian apples are the finest in the world, and will bring the very highest prices in the British markets, if confidence in the packing can be sustained ;

Whereas, we believe that about eighty-five per cent. of the apples grown in Ontario that are shipped to Great Britain are purchased, graded, packed and shipped by dealers, and, as it is to their interest as well as the interest of all concerned that a reliable brand should be established :

Therefore, resolved, that we do humbly pray that you will provide some remedy for the same.

We would suggest that certain marks or numbers be adopted to indicate certain grades and sizes of apples, and that it be made a misdemeanor for anyone to stamp these marks or numbers upon the outside of his packages unless the contents of the packages are in accordance therewith ; that the name and address of the owner and shipper be always required on either the inside or outside of closed packages intended for export ; and that an inspector be appointed, with power to open packages, and, if found fraudulent, to expose the offender.

And we further suggest that the terms used for grading be 'No. 1' and 'A No. 1,' 'No 1' to include sound apples reasonably free from worm holes, scabs or other blemishes, and to be not less than 2¼ inches in diameter, and grade 'A No. 1' the same, with apples not less than 2½ inches in diameter."

This resolution was adopted by large numbers of our Horticultural Societies, but objected to by the Burlington Horticultural Society, on the ground that all varieties could not be graded alike for sizes.

This matter is being considered by the Department, and we have no doubt that some scheme of grading and inspection of fruit packages will be prepared that will remedy the evil.

In view of the great importance of the grape industry, and the low prices prevailing in Canada, we prepared the following resolution to the Minister of Agriculture for the Dominion, and sent it also to various affiliated societies for approval :

"Whereas, the grape is one of the most important food products in Canada, and very large acreages are devoted to its production ;

Whereas, of late years the yield has been so abundant that our home markets are glutted, and the prices so low as to leave little profit to the grower ;

Whereas, certain varieties of Canadian grapes have superior flavor and excellent carrying qualities, as for example, the Rogers' hybrids ;

Whereas, we are persuaded that British consumers need only to become acquainted with the excellence of such grapes to become fond of them :

Therefore, resolved, that we humbly pray that you will export in large quantities our Rogers' grapes to the best British markets, and that they be put up in neat and attractive packages and sent out in costermonger carts in such a city as Manchester, until the trade reaches a firm basis."

This resolution was approved by the societies most heartily and duly forwarded to the Minister of Agriculture at Ottawa, but the Department there was so discouraged by the failure of the previous attempts made with mixed varieties, of which Concord and Niagara were prominent, that they would not touch them in 1899. Having full confidence that our Rogers' grapes would win favor in the British markets, we referred the matter to the Minister of Agriculture for our own Province, asking that the Board of Control of the Ontario Fruit Experiment Stations be authorized to make a small shipment of Rogers' grapes to Manchester. Consent being obtained, our secretary was authorized to forward a few hundred small cases, containing about 20 lbs. each, to B. W. Potter & Co., Manchester, who have agreed to place them in the hands of retailers and costers in that market. The result will be awaited with much interest.

Much complaint being made in certain quarters against the drastic nature of the revised San José Scale Act, your Executive called meetings to get the expression of the growers regarding it, and, when the Commission was appointed, everything possible was done to facilitate their work. The opinion expressed by most fruit growers at these meetings was that the pest should be utterly stamped out since the infested area was limited to about twenty square miles.

The following is a copy of a resolution which was unanimously passed by a public meeting of fruit growers at Grimsby, on the 16th June, 1899, called by

your executive, and a copy was forwarded to the Hon. John Dryden, Minister of Agriculture:

"Whereas, the minute San Jose scale is the most serious enemy that has ever threatened the fruit grower;

Whereas, the Government has passed an Act which is calculated to save the fruit orchards of Ontario from being infested with this scale;

Wheras, certain persons, whose orchards were found to be affected and who were ordered to have them destroyed, in their own and public interest, have waited upon the Minister of Agriculture asking that the law be not enforced;

Therefore, resolved, that we consider the Act to be all important in the interests of the farmers and fruit growers of Ontario, because it is the only sure way of saving our orchards from ultimate destruction by this terrible pest, and that we consider the interests of the many of much greater importance than the interests of the few.

We, therefore, express our deep regret that the operation of the law has been suspended at this season of the year, when the scale is beginning to spread and when a fortnight's delay may cause irreparable damage, and we earnestly beseech you to enforce the law, allowing the findings of the Commission, lately appointed by you, to govern your action with regard to future years.

And we further pray that you consider the interests of those growers whose orchards have had to be destroyed by so increasing the amount of compensation that they will have no just reason for complaint.'

Your executive also wrote the Hon. Sydney Fisher asking that the resolution of our Association asking that Mr. W. M. Orr be appointed to the charge of Ontario fruits at the Paris Exposition be considered. The reply was that Mr. A. McD. Allan, of Goderich, had already been appointed to superintend the horticultural exhibits of Ontario (including the fruit). The executive then wrote that the interests of the Ontario fruit men were so important in the foreign markets that, in our opinion, it was most desirable that the Vice-President of our Association be also sent over to assist in the representation of our interests.

Mr. Allan visited the executive in August, asking the co-operation of our Association, of our Experiment Stations and of our Horticultural Societies in making up about 800 bottles of Ontario fruits in advance, and in supplying fresh fruits for cold storage for the Paris Exposition. In this work the Secretary has written about 150 letters and, in response, has secured liberal contributions of our choicest fruits. Those for bottles were forwarded to Prof. H. L. Hutt of the O.A.C., Guelph, and the apples and pears for cold storage to Auguste Dupuis, Secretary for the Paris Exposition, Ottawa.

Our plant distribution has given great satisfaction. The following is a list of the plants sent out:—

737 Yellow Rambler rose, 388 Pink Rambler rose, 412 White Rambler rose, 504 Ampelopsis Veitchii, 262 Eleagnus Longipes, 261 Ginko, 420 improved Lombard plum, 291 Hughes plum, 228 Saunders plum, 182 North Star currant, 320 Columbian raspberry, 26 Crimson Rambler rose, 1 Dempsey pear, 5 Wickson plum.

A few of these had been winter killed, but were replaced free of cost. In response to inquiries as to whether the $500 or $600 spent in premiums would be better spent in enlargement of journal, a great difference of opinion has been expressed, some strongly urging one way and some another.

Your Executive hopes that during 1900 we may be able to attain both these ends. The journal has been embellished with numerous half-tone engravings, a fine new cover, and, with the exception of one or two months, enlarged to forty-eight pages. During 1900 we propose to enlarge the page and widen the columns and thus give considerable more matter with the same number of pages. We also propose a still more attractive cover.

In the carrying out of all this work we have expended as little money as was in keeping with the best interests of our Association. We have paid $153.00 for assistance to the Secretary in bookkeeping during the portion of the year, and will need to make a regular allowance for this in 1900.

Owing to the new postal regulations, we found it necessary to have the journal mailed at Grimsby, instead of Toronto, as heretofore, which made it necessary to engage a mailing room near the Grimsby post office. The same regulations also require postage on the journal which has amounted during 1899 to $41.36.

The additional number of journals printed, 5,000 a month, instead of 3,000 as per contract, and the additional eight pages, making forty-eight and cover, instead of forty as per contract, has increased the expense of printing the journal to $170 a month, which has been further increased in certain months by the demand for samples and for advertising space.

CONSERVATORY POSSIBLE IN OUR HOMES AT SMALL COST.

BY DR. HARRISON, KEENE.

In our younger days we were satisfied with the flowers that were in the windows, and we took much pleasure and so much joy out of them. Why, you as well as I, sir, have been in many a home, and seen with what joy and pride the lady of the house looked at that spindly thing in the kitchen window. It was the dead of winter, but it had a few sickly green leaves on and it was a joy to her heart. But as we have advanced in our social surroundings and in our better equipment all the way round, the fact is that that esthetic sense—which is one of the senses that has not been taken cognizance of as it should have been—demands a better quality of flower, and a larger variety.

Look at this exhibit and think of the fruit we had when we were boys. I had the pleasure of going to a school, walking a mile and a half, and it was a joy to our hearts when December came that we could go over to a crab-apple tree with apples about that size (showing) that would draw your mouth up. Were any of you in Toronto during the last crysanthemum show at the Pavilion? Look at those massive things. You can have those in your homes. Look at those ten inches in diameter. Look at those orchids which stood up on that dais; you can have these things. Look at those carnations which were so charming, and those roses which Dunlop had there; we can have those too, and not at great expense. How? That is the first question. There are two ways within the reach of every person of average means. In the first place, in constructing our verandahs, construct them with the idea that they are in touch with our principal living room, whether that is your library or dining room, or whether it is a sort of half withdrawing room. A wide verandah, a verandah on which you can get a large amount of side light; then you can have a bench along the side of that, and you would be surprised — I have tried it for myself — what a quantity and what a richness and what a fullness of bloom is possible. Now, you know that in so many of our homes now, instead of the old wood stove or the old base burner coal stove, we have our furnaces in the cellar. You say, "Well, what are you going to do with hot air?" You can do something with hot air, but not so much as with hot water; and there is no furnace, whether for wood or coal, in which you cannot put a little coil and carry that into the small conservatory and give it a generous, even heat which will give you beautiful flowers. Try to grow a certain class of flowers or roses, say carnation violets, in any ordinary room, and you cannot do it satisfactorily. Your roses will be overcome and devastated with aphis, and your carnations will fail to open up in their beauty, and the violets will religiously refuse to bloom satisfactorily and give their fragrance. Why? Because the temperature in the ordinary room is up and down, up and down, and that is inimical to plant prosperity. They do not like it any better than we do, the see-saw of life, and they don't prosper on it any better than we do. It is irritating, and they resent it at once. Another form of conservatory, which is more desirable and cheap—remember I am not talking about one that is the most desirable and expensive, not one that with its span and with its arched glass roof is one of the luxuries which are only available to the rich—but I am speaking of

that which is available to those of smaller means, that is, to build on the side of the house a lean-to conservatory. I have one in my mind's eye now, 12 feet long, 8¾ feet wide, with 100 plants that are doing sterling duty the whole year round, and supplying the house with a profusion of bouquets. That is, a small house, but you can have it anywhere 10, 11, 14 feet wide, and whatever length you want; but by giving a top glass to it you have plants that will grow straight up. It is just the ideal thing for your carnations. They open up beautifully without that crack on the side which is so apt to be with side light where they turn their faces. Having the top light you bring your plants nearly to the glass so as not to meet so much of the refractive rays, causing your plants to be healthier and sturdier in growth, and the flowers themselves to be richer in tint and sweeter in odor. Carry out the same idea again in regard to heating. If you do not put in a heater by itself, carry from your house furnace a coil and you can run your hot water underneath your plant shelves, or you can run it above it, or run each pipe along the glass. The advantage claimed for the latter plan is that the air that comes chilled from the glass becomes heated before it falls on the flowers. Either take in a verandah and make a conservatory of it, or build a lean-to and make a conservatory of it. You can take the latter and make $100 build your concern, put in your heating apparatus if you have not already a furnace in your cellar, and stock it with a fair variety of plants which you could not grow in your living rooms to advantage. Last year I saw a little conservatory of that sort 9.6 ft. wide, 24 feet long, with 500 plants, with bouquets of roses and carnations, geraniums, fuschias, and a large number of the other plants, supplying not only the household but a church on Sabbath day with bouquets, and furnishing flowers for nearly all the sick families within the radius of some three or four miles; and I am positive that that did not cost $80 in its whole outfit. It was built and heated by itself, which is the better way, because then you can regulate it. One of the old "Giant" stoves was taken and in the top of it there were five coils of inch pipe, and then that pipe was carried with ten coils under the bench, six coils on the back wall, and the whole cost of that plumbing was as follows: the cost of the stove was $6; the mason was paid $3.50 for bricking it in—the mason found the bricks; and the plumbing cost $22; the owner being a handy man built the walls himself, bought the material at the sash factory and had a carpenter two days to get the thing closed; and with that small cost he had all that beauty for himself and others. Do not attempt to put everything you can read of in the books into your conservatory, nor to put all that you read of in books in practice. Go slow. Feel your way. We are always safe in starting with geraniums. The geranium is one of God's greatest blessings in the flower line to humanity, because it wlll stand almost any treatment and show a smiling face. There are some plants that are just as pernickety as pernickety can be, but you must understand their pernicketiness or you will not get the pleasure from them. You who love horses do not want a horse that goes like a tame sheep, but you want one that makes you feel the ribbons, that it is a thing of life, and that you control it. That horse steps out and you feel that you can pass John A. Thompson as you go down the street. Flowers need to be handled in the same way. It is said that roses would be as sweet under any other name. I do not know. I never saw roses under any other name; but you know they are sweet and desirable. The plant that would be more amenable next to the geranium probably is the carnation; but those of you who are lovers of flowers know that what we called carnations when we were boys would not pass as flowers to-day. Look at those carnations, great beauties, splashed, white and rose, yellow, mauve, almost all the shades of color, and so sweet and so fragrant, and they can be grown in a little conservatory like that, so that a couple of dozen roots will give you carnations galore. Then next to that, in a small conservatory, it is desirable to have that which is ornamental. Then you come to the palms. Keep to the Kentias;

they will give satisfaction. There are certain plants which have somewhat been neglected in the greater majority of sections, and that is the begonia family—beautiful plants that require a little attention and little study and which are most desirable and full of beauty. They would be almost sufficient for any amateur to start with and would give him satisfaction. Where there are apples and music there should be flowers. You know there are birds in so many homes, and what a dirty thing that sweet little canary is, and how often you have to take the dust pan to gather up those broken seeds; but you could have fish—a small aquarium fitted with some of those Mediterranean carp known as gold fish, or even some of our own minnows or shiners or red roach, or beautiful sun-fish. A few of those in an aquarium, with a certain amount of plant life so as to balance your animal life with your botanical life. Water should not require changing any oftener than two or three months, and feed them a little German feed once a day, and you have got a thing of beauty and a joy forever. Their sinuous and graceful movements are a charm, and you can sit and watch them with pleasure, and they are ever so much more cleanly to look after than Dicky is.

BEAUTIFYING COUNTRY HOUSES.

By Prof. H. L. Hutt, O. A. C., Guelph.

The sturdy pioneers who first settled this country came with a determination to subdue the forests and to hew out for themselves homes in the wilderness. To them the idea of levelling a lawn and planting shade trees or ornamental shrubs would have been ridiculous. But we have now reached a period in the country's history when comfortable homes are thickly dotted throughout the land, and more attention is being given to the beautifying of the home surroundings. Not only is the skill of the landscape gardener more and more in demand, but there is a call for information on the subject by those who have not the means to employ a professional gardener. In this brief paper we shall attempt merely to call attention to some of the leading principles which should guide in laying out and beautifying the surroundings of a country home, and what applies to the country home, will in many cases apply equally well in the ornamenting of a town lot.

The first idea to be grasped is that the most beautiful scenes are as a rule more or less natural. We must, therefore, accept nature as our teacher, and study the materials and combinations which go to make up natural beauties.

The materials with which the landscape gardener has to deal may be classified as natural and artificial. The natural materials are the ground, grass, trees, shrubs, vines, herbaceous plants and annuals, and in some cases rocks and bodies of water. The artificial materials are trees and shrubs clipped into unnatural shapes, geometrical beds of improved flowers, terraces, walks, drives, buildings, fountains, statuary, etc. The skill of the landscape gardener consists of the judicious use of these materials. Let us now consider some of these a little more fully.

The Ground. One of the most important features in the ground surrounding a home is the contour of its surface. This is what gives character to a place. A low lying lawn with something of a depression in the centre has a tame appearance, while a similar lawn with but a slight crowning in the centre has an altogether different look. Sometimes a perfectly straight surface line is pleasing, and the level lawn is more in keeping with the place and its surroundings than any other could be, but as a rule some variation from the straight line is preferable. In nature we take more delight in bold outlines of hills and valleys than we do in level

stretches of country. This is because we love the variety which hill and hollow afford, and this suggests the desirability of introducing undulations in landscape gardening whenever the size of the grounds and other circumstances will admit.

The buildings should, of course, be on the highest elevation. and the grounds should be made to slope away from them. On a steep hillside the grounds may have to be terraced. This, if well done, adds much to the appearance of a place, but likewise adds considerably to the cost. Whether the grounds are flat or rolling the irregularities of the surface should be levelled and smoothed so that the mower may be worked easily. Wherever much grading or filling has to be done due allowance must be made for settling, and a few inches of good surface soil should always be left on the top. The character of the surface soil is a matter of great importance, because on it depends the luxuriance or poverty of the grass and trees growing upon it.

THE GREEN SWARD. There are two ways of clothing the ground with grass, either by sodding it or by sowing grass seeds. On small plots or steep banks and along borders sodding is the quickest and most satisfactory method, but on large areas seeding is not only the cheapest but the best. In preparing the ground for seeding it should be plowed, harrowed, rolled and made as fine as possible, and as a final preparation nothing is better than going over it carefully with a garden rake.

The kind of seed to sow is a matter of importance. Coarse grasses, such as timothy, are not suitable for lawn making. Many of the finer and more delicate grasses may be obtained in "lawn grass mixtures," but the most satisfactory mixture we have found is made up of equal parts by weight of Kentucky blue-grass, red-top grass, and white Dutch clover. All of these are hardy and stand well the extremes of our climate. The seeding should be done on a still day, when there is no wind to carry the lighter seeds. Thick seeding should be the rule. Three or four bushels per acre is none too thick for seeding down a lawn. In fact the grass should come up as thick as the hair on a dog's back. After the seed is sown it should be lightly raked in, and if the weather is dry it is well to go over the ground with a hand roller. The work of making a lawn may be done at almost any time of the year, but where much levelling and filling is necessary it is well to do the grading in the fall, so that the ground will have finished settling by spring, and then the surface may be raked over as soon as it is dry enough to work, and the seeds sown as early as possible. A lawn sown early in the spring should be nice and green by the middle of summer, or seeds sown early in the fall should give a good grassy carpet for the next summer.

KEEPING A LAWN. To keep a lawn in prime velvety condition it should be mowed frequently, particularly during the season of rapid growth. The mowings should be so frequent that none of the cut grass need be raked off. This is the practice followed on well kept city lawns where men, money and mowers are available. On the farm where these articles are sometimes not so plentiful, and where the area to be gone over is usually greater, it may be kept in very respectable condition with the ordinary farm mower, the cutter bar of which should be set low and the knives kept sharp. On the farm the front yard and back yard, the lanes and the roadsides should all be levelled, seeded and put into such condition that they can all be gone over with the farm mower, and if the mowing is done as often as the grass is high enough for the knives to catch it nicely the improvement made in the appearance of a place would in many cases add nearly 50 per cent. to the value of the property.

To maintain a luxuriant growth and a rich dark green in the color of the grass, the lawn should occasionally receive a top dressing of stable manure in the fall. The soluble portion of this is washed into the ground by the fall and spring rains, and early in the spring the coarsest portion of it should be raked off.

Trees and Shrubs. In the trees and shrubs we have some of the finest forms of natural beauty. They present a great variety of ornamental qualities, in habit of growth, in size, in color of bark and foliage and in their flowers.

Taking the trees first, they may naturally be divided into two classes, the deciduous and the evergreen trees. If time permitted we could give a lengthy list and mention the special claim of each to a place on the lawn, but we must be content with mentioning only a few of the most desirable. Among the maples we have the sugar maples, the soft maples and Weir's cut-leaved variety of the same, the Sycamore maple and the Manitoba maple, which is particularly valuable on new places on account of its rapid growth, but along with it should be planted some of the more durable trees, which will come in and last long after the Manitoba maple has served its purpose. As a successor to it we know of none better than our native American elm. In its finest form, with feathered trunk, high spreading arms and long, pendulous branches, this is, in our opinion, the most stately and graceful of our native trees. On large grounds, where there is room for variety, some of the rugged oaks and fragrant lindens add a charm to the scene. The cut-leaf weeping white birch is very ornamental in both summer and winter, and shows a striking color contrast, particularly when placed so as to have for a background a group of evergreens or a dark colored building.

Among the evergreens the pines and spruces occupy a first rank. The Austrian and Scotch pines make handsome specimens, although in its younger days our native white pine is equal to, if not superior to, any of the foreigners. The same might also be said of our native white spruces, as compared with its more vigorous relatives from Norway. But for a handsome specimen of nature's coloring let us have the dainty little blue spruce of Colorado. Among the arbor vitaes, junipers and retinosperas, we have some very beautiful forms, such as the pyramidal and globose arbor vitae, the tall Irish juniper and the plumose retinospera.

Ornamental Shrubs. For a list of some of the most desirable and hardy ornamental shrubs adapted to our northern section, I cannot do better than refer intending planters to the valuable list given in Mr. Macoun's report in the Central Experimental Farm Report for 1897. One hundred species and varieties are there mentioned, with twenty-five of the most desirable marked. If we were compelled to reduce the list to half of that number, we would from our own experience select the following: The Caragana or Siberian pea-tree, Hydrangea paniculata, .he Tartarian bush honeysuckle, the mock orange or Philadelphus, the golden currant, Spirea Van Houtii, the golden elder, the old-fashioned lilacs in variety, the snowball or viburnum, and last but not least, roses in variety.

The Arrangement of Trees and Shrubs. To artistically arrange and distribute a collection of trees and shrubs on the lawn requires much more skill and judgment than to set out trees in a straight line in an orchard. The following are a few of the principles which should guide in lawn planting:

1. Follow as nearly as possible the natural order of arrangement. Nature does not plant trees in straight lines, but scatters them about in irregular profusion, in too much profusion, in fact, to be followed out fully in lawn planting. It is often necessary, therefore, to modify the natural arrangement to meet the needs of the case. One has said that "the aim should be to exhibit nature idealized rather than nature real." A prominent American landscape gardener tells us that for his first lesson in arranging trees on the lawn he was told to take in his hand as many stones as he had trees to plant; to stand by the house and throw them in the direction he wished the trees to stand, then plant wherever the stones fell.

And he says that with a few slight modifications the effect was all that could be desired.

2. Arrange to give an air of breadth and expanse to the place. This is a most desirable effect, and is secured by preserving a more or less open lawn in front of the house, by scattering and grouping the larger trees at the outside of the grounds so as to more or less hide the boundaries. This suggests an unlimited extent beyond what the eye can see at any point. Another means is by opening vistas between the trees, looking out upon distant scenes beyond the boundaries. In this way we may shut out undesirable objects, and we may appropriate to ourselves desirable distant scenes, such as a wooded hillside, a stretch of river or a church spire, and thus make our little grounds seem like part of an extensive park.

3. Arrange for trees to give comfort as well as ornament. One of the first considerations should be to shade the buildings from the heat of the sun and to shelter them from the sweep of the prevailing winds. On the south and west should be planted a few of the largest shade trees, such as elms or maples, not so close as to exclude the light from any of the windows, nor so that any of the branches, when the trees are full grown, will overhang the house, but close enough that their shade will fall upon it. In all planting the effect should be watched from the principal windows, and we must take into consideration what the result would be when the trees are full grown.

As a protection against the sweeping winds of winter some of the strong growing evergreens, such as the pines and spruces, are most useful. Thick belts or clumps of these should be planted in the most exposed quarter, and along with them may be planted a few of the light colored deciduous trees. In winter the evergreens give a cozy appearance to the place, and in summer their sombre darkness is relieved by the bright green of the deciduous trees.

In arranging the smaller trees and flowering shrubs these may be grouped into ornamental clumps, or occasionally fine specimens may stand out by themselves. When grouping into small clumps, the largest specimens should be planted in the centre, and along the borders the smallest shrubs should come to the front, so as to blend the grass with the taller trees in the background.

Beautiful color combinations and contrasts, both in flower and foliage, may often be arranged if the planter understands his work. For instance, a beautiful color contrast is obtained by planting a purple-leaved barberry near a golden-leaved spiræa, or a dark Austrian pine as a background for one of the light colored Colorado spruces.

Vines and Climbers. Among the vines and climbers we have a number of beautiful species which may be made very effective in many ways in beautifying the home surroundings. They are particularly valuable on small grounds and town lots as they take up so little room, but they are also quite as valuable in beautifying a country home. One of the most hardy and vigorous is the common Virginia creeper. This is excellent for covering a summer-house, a screen or any unsightly wooden wall. As a covering for a brick or stone wall the Boston Ivy or Ampelopsis Veitchii is one of the handsomest. In northern sections it requires winter protection for the first few winters, but when once established it grows rapidly, and will soon convert a brown or red front into a wall of living green. For a handsome, hardy flowering climber we have nothing to equal Clematis Jackmanii, with its large purple flowers, and Clematis Paniculata with its innumerable small white flowers late in the fall. Hall's climbing honeysuckle and the Chinese Wistaria are beautiful climbers well adapted to climbing verandah posts or festooning a balcony, but they will not stand our winters without protection except in the southern parts of the Province.

WALKS AND DRIVES. These are not in themselves very ornamental, but they are a necessity and have an important effect on the appearance of a place.

When properly located they convey the idea that the place is inhabited, and they seem to impart an air of welcome.

As the walks and drives are artificial and not in themselves ornamental there should be as few of them as possible. Business roads should as a rule be straight, but pleasure drives give more pleasure if they are laid out in graceful curves. The curves give variety and help to relieve the angular outlines of the buildings. They should not, however, be introduced at the expense of utility, and should offer no temptation to take short cuts across the grass. Whenever a curve is introduced there should be trees or some other object in the road to make the curve appear necessary. If they are not there they may be planted when the drive is laid out. A curve without some apparent cause for it looks meaningless and affected.

The drive should wherever possible enter at the side of the lawn, and curve gently around towards the buildings as though it were the nearest and most natural way of approach. It should be dotted here and there along the sides with trees and shrubbery which partly screen the buildings from sight, so that we keep getting a different view of the house as we approach. This gives variety and pleasure, and always leaves just enough unseen to make us feel like following it up to see where it leads or ends up.

The width the drives and walks should vary according to their length and the amount of travel upon them. If long and much travelled the drive must be wide enough for two rigs to pass easily, but if short and not so much used, 8-10 feet or room for one wagon is enough. Walks or foot-paths will vary from 3-5 feet. The drives should be properly graded and made slightly crowning from the centre to the sides so as to give good drainage. If good gravel is obtainable they should be covered with gravel, raked smooth and rolled hard.

FENCES. As a rule fences enter largely into most landscapes and are worthy of note. They are artificial materials, and at best they are necessary eyesores, but in the majority of cases their necessity is only imaginary. If all of the really unnecessary fences were removed, and the ground which they occupy levelled and seeded down or put under crop it would make a wonderful difference in the appearance of the country. It would remove a great harbor for weeds and insects; it would effect a great saving in labor and expense, and it would remove one of the most striking features which advertise the slovenly farmers all over the country. The only fences necessary, or which should be necessary, are those for the purpose of fencing in our stock, and not fencing in that of our neighbors. These, in many cases, might be movable or temporary. Roadside fences might be dispensed with, the ground levelled and seeded and the grass kept mowed from the boundary to the roadbed. Bill Nye says that "The farm without a fence in front of it looks as if the owner were honest and thought his neighbors the same." If a permanent fence is necessary let it be as inconspicuous as possible, or let it be an ornamental hedge.

Some of the other materials of landscape gardening are trees, trimmed into shape or out of shape, fountains and statuary, buildings, flower beds of geometrical designs. All of these artificial materials should be used with as much discretion as one should use in wearing fine jewellery. The more the artificial prevails in the general surroundings the more these can be used without giving offence. In proximity to large and expensive buildings, or in extensive parks, they may have their place, but on the farmer's lawn, where most of the surroundings are natural, and where the buildings are not elaborate and costly, they would be altogether out of place.

A KNOWLEDGE OF FRUIT GROWING.

By J. E. Farwell, Whitby.

Allow me to join in acknowledging the honor you have done our town by holding your present meeting here. Your meeting in this section of the county, where fruit growing has received considerable attention, will stimulate and extend here the great industry in which you are so actively engaged and so deeply interested.

Glancing through the reports of your transactions, and noticing the wide scope of your discussions, and the care and attention which the minutest details connected with your business have received, it seems a hopeless task for an outsider to say anything which will interest you or your visitors. Perhaps I may be pardoned for throwing at you some odds and ends about the subject.

There is no branch of work connected with the cultivation of the soil which so interests the young and old as fruit growing. One might hope that the injunction against covetousness was not intended for small boys. If it was they have been, are now and ever will be great sinners, world without end, as far as fruit is concerned. There have been good boys who have never cast longing eyes at ripe fruit belonging to others, but their goings to and fro on the earth have been as rare as angels' visits. Do not *we* know it? Have we not been there? And our successors in raids upon orchards and gardens, are they not with us to this day?

The old song, "Do they miss me at home?" was well parodied in the words:

> "They don't wish me at home, though they miss me,
> Dark nights were my desire for this reason,
> Some orchard I would visit alone,
> Next morning some farmer would mention
> My name with some fruit that was gone."

There *are* fruit growers who can manage to grow fruit where there are boys and yet have little trouble with them, and who are spared the annoyance of losing the finest fruit just about the time it is needed for exhibition purposes Allow me to suggest as a subject for a useful paper, "The experience and practice of the fruit grower who can so manage matters as to keep his fruit, his temper and the friendship of the boys."

It is well not to be too hard on the boys. Perhaps this desire to get good fruit, where it is to be got, is the effect of heredity. Our ancestors, the grand old gardener, Adam and his wife, had shown a liking for fruit that did not belong to them, and so furnished Milton with the material for England's greatest epic poem:

> "Of man's first disobedience and the fruit
> Of that forbidden tree, whose mortal taste
> Brought death into the world, and all our woe
> With loss of Eden."

This growing and caring for fruit is a most respectable, ancient and honorable occupation. You see it was practised by the "first families." Tennyson in his "Clara Vere de Vere," makes the young yeoman say to the Earl's daughter:

> "Trust me, Clara Vere de Vere,
> From yon blue Heavens above us bent
> The grand old gardener and his wife smile
> At the claims of long descent."

Before the first theft of apples humanity had an uncommonly easy time of it in dressing and keeping a garden without thorns and thistles in it. Perhaps they had not to contend with *Engonia subsignaria, Diosophila ampelophila*

aspīdīotus conchi-formis and sixty more of the pests which trouble the soul and tax the enery and ingenuity of the fruit grower; at any rate they had the pleasure of eating their bread without sweating to get it. The man was turned out of the garden. Someone, I think Downing, says: "He has always tried to get back again." There is perhaps a disposition in man to take to a savage life, but if you can keep him within the bounds of civilization he is sure to go into the gardening business, a "fruit garden," a "root garden," or if nothing better can be had, a "window garden."

Throughout sacred and profane history, mythology and poetry we have abundant references to fruit and fruit growing. We find the figs, grapes, the pomegranates of Eschol and the olive trees of Gethsemane. We have the golden apples which Ge the earth presented to Hera on her marriage with Jupiter, and which the Hesperides were set to guard lest the same old game of apple stealing should go on; and it is said, that the apples were stolen by Hercules in the performance of one of his twelve labors.

Then we have the golden apple of discord which the unfortunate shepherd Paris had to award to the prettiest of three goddesses. Of course he pleased no one but Aphrodite to whom he awarded it, and so caused the Trojan war. "The sour grapes" which the fox could not reach, the disappointed hopes and crushed expectations of mortals, like

"Dead sea fruits which tempt the eye
But turn to ashes on the lips."

When one has amassed a fortune of five hundred thousand dollars he has a "plum" two hundred and fifty thousand is "half a plum." The plunger on the race course or in Bank stocks is bound to have a "plum" or a "plum stone." Of all the fruits, the poets seem to prefer the apple, one of them says:

"So sweetened with the Summer light the full juiced apple,
Waxing over mellow, drops in a silent autumn night."

And just then and there Sir Isaac Newton, the philosopher, seeing the apple drop *down* wondered why it did not drop *upwards*, like a puff of smoke, and then he sought out and thought out the great law of gravitation.

Why not plant apple trees along side the highways for the wayfaring man, the small boy, and for the poor and needy? Their shade is quite as good as that of many other shade trees. I have pleasant recollections of seeing somewhere in Europe rows of apple trees upon the sides of the highways "where fragrant blossoms fringed the apple boughs."

Do people realize the advantages of planting apple trees or other fruit trees? Do they realize that while they contribute to the beauty of the landscape they tend to refine and elevate the owners? Bryant has said:

"What plant we in this apple tree?
Sweets for a hundred flowering springs,
To load the May winds restless wings,
When from the orchard row he pours
Its fragrance thro' the open doors,
A world of blossoms for the bee,
Flowers for the sick girl's silent room
For the glad infant sprigs of bloom
We plant with the apple tree."

Show us a country where there can be raised good wheat, good apples, and good speckled trout, you have shown us a country where a white man can live and be glad that he is alive, for there he is sure to find a good soil, a good climate and good water.

Cannot our schools be made to contribute to the success of the fruit growing industry? Cannot pupils be taught not only to refrain from injuring fruit and other trees; but also have inculcated a love for them and a thorough appreciation of the advantages to be derived from them? Can they not be impressed with the idea of the millionare founder of the Gerrard College that if he knew he should die to-morrow he would wish to plant a tree to-day, and so have done something to leave the world better than he found it.

I have for a long time had a theory that it would be a great benefit to the people of this Province if the study of Latin, Greek, German and French were discontinued in one-third or one-fourth of our High Schools and Collegiate Institutes, and that manual training and instruction in the use of tools and implements and in subjects having a practical relation to agriculture, fruit growing, mechanics, manufacturing and mining should be substituted therefor. When one remembers that the number engaged in teaching and other professions is but small compared with the great army who are engaged in agricultural, mechanical, manufacturing mining and commercial pursuits, and the small amount of taxes paid by professional men as compared with the large amount paid by the producers of wealth, one might well suppose that the struggle would have all along been, how to raise the means for paying instructors in these languages and that there certainly have been found in every county at least one school for teaching all that could be taught there to aid the great producing classes in their struggle for existence.

Can such subjects be taught under such surroundings as will keep the pupils in line with their intended occupation and not sidetrack them into the professions? Is it not a well-founded complaint that when once the boy, whose parents desire him to follow farming or a trade, or to engage in business, gets into a high school there is but small chance of getting him back to the farm, the workshop or the store? Sir Lyon Playfair says that "schools should aid boys in discovering the class of knowledge best suited to their mental capacities, so that knowledge may be specialized to cultivate the powers of men to the fullest extent."

If the carrying on of agriculture, mining and manufactures in the best possible manner is of any importance to this country, it is about time some provision was made for schools which will "mould the minds of boys according to their mental varieties. By the adoption of this plan, boys not destined for the professions would receive the same instruction in English, mathematics and commercial subjects as those who are to take up a profession. The sons of farmers would receive instruction in zoology and botany, which would explain the blights, the insects which attack the grain, roots and fruits, and the means of preventing injury from these as far as known, the value of different kinds of manures and the relation of chemistry to agriculture. The teacher of science would give instruction in mineralogy and geology, particularly as to exploring for valuable minerals, how and where to find them, and what to do with them when they have been found. If the mineral wealth of this country amounts to a tithe of what it is reported to be, it is time more of our young men were being instructed in the above matters. Is it not time the experiment was tried? One-third of the expenditure of the public money for schools at least, should be in the way of practical education. Have we yet exhausted the agricultural and fruit-growing capabilities of Ontario's soil? Is there anything in it yet for the farmer and the fruit grower? And are there not yet abundant opportunities for making a living for independence, nay, for a competence, to be found in cultivating the lands of Ontario? Will not the teaching of subjects in connection with pursuits in which the pupils are to engage tend to hasten an era of prosperity which the Province has never known?

THE SAN JOSÉ SCALE.

BY G. T. POWELL, GHENT, N.Y.

A request has been made that a few words might be said here upon the threatening danger from the San José scale to the fruit-growing and other interests of this Province. In a very brief manner let me point out the fact that the greatest hindrance to the profitable pursuit of horticulture is from the insect damages that come to trees and to fruits. I want to mention only one or two illustrations. A little more than ten years ago there was introduced into Massachusetts what is known as the Gypsy Moth. An entomologist from France brought over to this country a few of those Gypsy Moths to cross with the silk worm, thereby hoping to get an improved silk worm that would be of great value to America. While he was experimenting with these few Gypsy Moths there came a gust of wind that blew a few of them out of the open window near the vicinity of Boston. He closed his window, went out immediately, but he could not find them. No further thought was given, but about two years after that there was discovered near Boston the ravages of a caterpillar that was becoming somewhat alarming. The forests were being denuded of their foliage, and that was the introduction into this country of the Gypsy Moth, with its very destructive work as it is being carried on to-day in Massachusetts. It has cost the State of Massachusetts nearly one million dollars simply to hold it in check. The annual appropriations are to-day $200,000 just to keep it within limits near the city of Boston. It has denuded their parks, and it has entered their forests, and if it gets beyond the control of the present commission, it threatens to destroy the vegetation of the State of Massachusetts. The Gypsy Moth deposits its eggs in the grass, in the trees, anywhere, in the stone walls, in the crevices of rocks, and it requires to day a force of 500 men who are to-day fighting it along different lines with fire, even going into the rocks and the stone walls and injecting kerosene oil, and fire to follow it—this is the manner in which the Gypsy Moth is being fought. Men are being sent to the tops of high trees, great oaks and elms, with ropes fastened about their waists. They swing themselves out to the outermost branches of those great trees, there to pick off those egg nests, and you can imagine the great amount of labor required to just simply keep this great pest in check. Now the Brown-tailed Moth is even worse than this. The Brown-tailed Moth multiplies so rapidly that when the caterpillars begin to migrate they simply cover the sidewalks and the streets. They also cover the sides of buildings and they get inside the houses and into every part of the house—into the closets and into the drawers and bureaus, and into every nook and cranny. During the month of September last they were so numerous upon the streets of Lynn that the horses and vehicles passing over the pavements, and the people walking along the sidewalks, crushed them in such numbers that during the hot month of August the city of Lynn was threatened with a pestilence. Now, these are illustrations which I have mentioned to point out the importance, in the discovery of a serious insect pest within your territory, that the most vigilant means be taken to stamp that thing out upon its first discovery if possible.

Now the San Jose scale comes in here at this time as a threatening danger to our horticultural interests. It was my privilege during the past winter to have spent several weeks in Maryland attending the fruit growers' meetings and farmers' institutes. I saw the workings of this pest where it had committed its worst ravages in that state. I remember passing along and through one peach orchard containing 27,000 trees, and every tree destroyed, absolutely dead, in that peach orchard from the effects of the San Jose scale. So you can see the extent to which the damage is perpetrated when an orchard of this number of trees was absolutely destroyed by this Scale. It is surprising how the Scale is

spreading not only in the states, but here in your own country; and it becomes of the utmost importance that the Ontario Fruit Growers' Association in its work shall point out, as it is doing so wisely, the danger that threatens your great horticultural interests from this pest. We have much to learn about it, more especially in relation to its control; but this fact is evident, that while it seems to do its worst work in the warmer climates, yet it is possible for it to become acclimated almost anywhere, and there is where its danger lies. There do not seem to be at present parasites that are following it up. That is the trouble with the Gypsy Moth of Massachusetts. The parasites which keep it in check in France do not exist or are not here, and hence the moth has its full swing, and therein lies its great danger. In New York state we have the Scale to a far greater extent than I desire to admit. It is surprising where we are meeting it. In my own county of Columbia, along on the Hudson River, while conducting a series of lectures upon natural sciences touching upon the point to which the last speaker so forcibly alluded—the necessity of introducing into our public schools the studies of natural sciences, which may be applied to agriculture and horticulture—going through those beautiful gardens and orchards to discover some insect life that had been treated during the afternoon lectures, I was surprised to come upon a beautiful pear orchard, and in the centre of it found fifty trees that were in a declining condition. In calling the attention of this class of boys and girls to these trees they saw at once that the trees were from some cause not thrifty, that they were declining. We walked into the orchard to study the causes that could produce just in this one circle, about fifty trees declining and dying, and to my surprise came at once upon the San Jose scale. Not a single inhabitant of that section dreamed or supposed for a moment that that pest was in their midst. Upon putting the microscope upon it to be absolutely certain, the word was sent home by these children to say to their parents that they had one of the most dangerous pests in their community that possibly could have reached them. The result was that within twenty-four hours an invitation was extended to hold a horticultural meeting near Germantown to discuss the question of the San Jose scale and every fruit grower of the town was present when that meeting was held, that he might know all that could be learned about it, a special entomologist having come to attend this meeting. It has since been known in many portions of New York State. One of my own neighbors within eight miles distant of me has it in his apple orchard, in his pear orchard, in his peach trees, on his plum trees, on his raspberries, and in fact it seems as though it attacks almost all kinds of trees and plants; so that it becomes of the utmost importance now that we study this Scale in its habits and in its possible control. It is so important that it seems to me it is within the function of the Government that it shall lend its aid—which I am certain it will—in the annihilation, if that be possible, of this Scale. One of the discouraging features of this whole subject is the questionable fact that perhaps it never can be annihilated when it once gets a foot-hold in a community. When we consider that one pair will become the progenitors of something like three billions in a single season you may understand the gigantic effort that must be made to annihilate an insect like that, one that spreads with such wonderful rapidity, one that multiplies to such a wonderful extent. You may at once understand that it is a pest that cannot be lightly dealt with in its extermination. There might be very much said in regard to its treatment but that subject, I think, is to come up again, and hence it will not be necessary for me to go into a detailed discussion of that Scale now. We have been trying to estimate the damage that comes to New York State from the insect pests that afflict our fruit trees and forest trees, our shrubbery, our green crops, and our live stock interests. During a very careful study made four years ago into the condition of agriculture in New York State, and the causes that were sending populations adrift from the rural districts to

the cities, this fact was elicited in this study of the causes which were making agriculture in New York State so discouraging: On application to the State Entomologist, Dr. Lintner, to give me a careful estimate of the annual losses which come to the territory of New York State from the insects, his reply was, after a very careful study of the subject, and from reports which had been made for several years previous, that the annual loss to the people of New York State from insect depredations alone were not less than $26,000,000 annually. Now, that is appalling. And is there any wonder that farmers and fruit growers become discouraged, and sometime perhaps abandon their holdings and go to the city, hoping there perhaps to meet the wants of life easier? Is it any wonder that there is a drifting away from the soil, when $26,000,000 annually, year after year, is the loss that comes to the cultivators of fruit and the cultivators of agricultural productions? That, it seems to me, is appalling; and there is no line of work that your Association can do so valuable to your people as to follow up now persistently this San Jose scale, and watch for the introduction of any other insect pest that may come here and cut down your profits in this most delightful work of fruit culture, if it were not for the damages which follow from this cause.

TREASURER'S REPORT, 1898-9.

Receipts.			Expenditures.		
Balance on hand December 1, 1898		$784 96	*Canadian Horticulturist*	$2,499 38	
Membership fees	$4,087 77		Salary Secretary-Editor	1,200 00	
Advertisements	636 67		Commissions	673 93	
Samples, etc	19 60		Plant distribution	560 68	
Bound volumes, etc	13 40		Illustrations	419 12	
Government grant	1,800 00		Affiliated societies	247 65	
		6,557 44	Printing and stationery	213 15	
			Directors' expenses	206 57	
			Bookkeeper	153 00	
			Postage and telegrams	143 60	
			Reporting	104 10	
			Express and freight	76 75	
			Committees and delegations	74 59	
			Advertising	35 60	
			Binding *Canadian Horticulturist*	29 64	
			Collection and interest	27 30	
			Auditing	21 00	
			Miscellaneous	10 50	
			Books	7 33	
			Caretaker at annual meeting	3 00	
					$6,706 89
			Balance on hand December 1, 1899		635 51
		$7,342 40			$7,342 40

Upon motion of Mr. A. H. Pettit, seconded by Mr. E. D. Smith, the report was adopted.

A. H. Pettit moved, seconded by Mr. Pattison, that the minutes of the annual meeting be taken as if read, they having been printed in the Annual Report. Carried.

ELECTION OF OFFICERS.

The election of officers was then proceeded with, and resulted as given on page 4.

REPORT OF FRUIT EXHIBIT COMMITTEE.

Your committee on Fruit Exhibits begs to make the following report:—

The exhibition of fruits made this year is above the average, both in size and quality, notwithstanding the light crop. It is gratifying to the committee to find that so many of the members of the Association took the trouble this year to bring some samples. It is inconvenient for members to bring large exhibits from long distances, but it is very little trouble to bring a small collection of those varieties which will be of greatest interest.

Mr. W. M. Orr, Fruitland, Ont.: Exhibited three varieties of pears, two seedling apples, and two plates of fine Vergennes grapes. The seedling apples were not of special merit.

E. Morris, Welland, Ont.: Plate of fine specimens of the Horn apple, said to be a very late keeper.

E. Lick, Oshawa, Ont.: Fine specimens of Fallawater and Cranberry Pippin apples, and another variety.

Jos. White, Whitby, Ont.: Plate of Ontario apples.

R. L. Huggard, Whitby, Ont.: A large collection of apples and pears. Among the newer apples being Bismarck and Salome. His samples of Salome were particularly good.

A. M. Ross, Whitby, Ont.: Plate of quinces grown at Whitby, which were of fair quality.

W. H. Dempsey, Trenton, Ont.: Collection of 19 varieties of apples, many of which had not hitherto been exhibited before this society. Among those shown were:—Jefferies, Mammoth Black Twig, York Imperial, Windsor Chief. Parlin's Beauty, Maclean, Winter Banana, La Rochelle, Boiken, Duffy's Seedling, Pioneer, Rome Beauty, Beaton Co. Beauty, and Trenton. Among those worthy of special mention were: Maclean,—A yellow, medium sized apple, mild subacid, very tender flesh, pleasant flavour. Winter Banana,—A large yellow apple with a pink blush, very tender flesh, mild subacid, high flavour. Duffy's Seedling,—A Californian seedling above medium size, bright red, conical, subacid, medium quality, a very attractive apple; season probably March. York Imperial,—A red winter apple which will probably be grown more in Canada in the future.

Central Experimental Farm, Ottawa: Twenty-one varieties of apples were exhibited. Gano, Patten's Greening, Shiawassee Beauty, and Milwaukee, were varieties shown which are succeeding well at Ottawa but are not yet very generally known.

Charles Young, Richard's Landing, Ont.: An apple for name. This is probably a Russian sort called Grandmother.

Harold Jones, Maitland, Ont.: Some fine specimens of the Scarlet Pippin apple. This is a very fine looking apple of good quality which Mr. Jones says brings a better price than Fameuse.

G. C. Caston, Craighurst, Ont.: Specimens of Gano and Boiken apples.

Burlington Horticultural Society: Plate of Baldwins.

W. M. Robson, Lindsay, Ont.: Sent specimens of McIntosh Red and an apple for name which was found to be King.

C. W. Smith, Whitby, Ont.: A very fine plate of Northern Spy apples.

Smith & Reid, St. Catharines, Ont.: Good specimens of Princess Louise apples, also three varieties of pears.

R. W. Shepherd, Como, P.Q.: Some fine specimens of Winter St. Lawrence apple.

Mr. Carpenter, Winona, Ont.: Two bushels of apples, one from the top of a barrel, and one from the middle. The difference was very marked.

Some other fruits were placed on the table after the committee had finished its work, and opportunity was not afforded to include them here. Some specimens also were not labelled.

W. T. Macoun, (Chairman).
E. Morris,
W. H. Dempsey,
C. W. Van Duzer.

REPORT OF COMMITTEE ON OCEAN AND RAILWAY TRANSPORTATION OF FRUIT.

Mr. W. H. Bunting, speaking on behalf of the Committee said: There are two sections of this matter that are important to us as fruit growers—the question of service and the question of rates. As I understand it, this Association for the last thirty years has been making efforts largely devoted to the improvement and cultivation of fruits—efforts to provide for this country a finer class of fruits, and more abundant. During the past few years the results of the efforts of this Association and of individuals have been very apparent. There is no doubt that we have succeeded as a class in producing an abundance of good fruits, and each year the output is rapidly increasing. The time has come when better distribution of the products of our soil and orchards and vineyards is very necessary. The claim is made sometimes that we are producing more fruit than the country will take. It may be possible that in some lines we have been doing so; but in looking the question fully in the face it has impressed itself upon my mind that we are not at the present time producing, except in seasons of occasional glut, very much more than we require; but that it is the difficulty in presenting to the consumers of our country and of the home land the products of our farms and of our orchards in a good condition and quickly that has occasioned the trouble in connection with this. It is a deplorable fact that during the past few years, particularly in 1896 and 1897 in the Niagara District, from which I come, that a large proportion of our fine crop of peaches and apples in those two years was allowed to go entirely to waste, and the business for the time being was in a completely demoralized condition. Now, this is lamentable, and in spite of the fact that there are sections of our country that even during those years stated time and again that they did not receive the quantities of fruit that they could have used to advantage. In connection with the two phases of this question—that of service and that of rates—it is very apparent that we need relief, and we need improvement in both lines. The question of rates largely depends upon the individual transportation companies. Each company has a free hand to improve their service in whatever way they see fit. When it comes to the question of the reduction of rates or more favorable rates for the grower, that is a question in which all the transportation companies are interested; and as far as the railway companies are concerned, no single railway company is in a position to make a rate that would be detrimental or would not be concurred in by the other roads. So when we come to that question we have not only to meet one company but all, and we have to satisfy them that the claims that we present are reasonable and just and should be considered. I may say that we have not at the present time the facilities in the shape of service that we should have. While some little effort has been made to supply during the season refrigator cars for the better transportation of our more perishable fruits by freight, yet we have not received from the railroads the consideration that we should have received in that respect. We require a full equipment of suitable ventilated cars for certain classes of our products, and we also require a good refrigator service during the hot months of the summer for the proper distribution of our fruits.

throughout the country. There is this difficulty with which we have to contend and one that is pretty hard for us as a class to get over. We will be met time and again, in asking for better accommodation, with the reply and the objection that our trade is not regular—that we are not in a position in the early spring to guarantee to any transportation company a certain output, and consequently our wants being irregular, and being dependent on the season, they are not willing or it is no object to them to provide in advance a sufficient equipment that may possibly not be needed during the season. Now, we cannot get over that altogether; but as a class in the various sections of our country, by co-operation and by planning during the earlier seasons, and planning one year for the future, we can, it seems to me get into a position whereby we can offer some reasonable guarantee to the railway people that if they provide suitable accommodation that accommodation will be utilized. I may say at St. Catharines during the past two years something of that kind has been in course of organization. We have been endeavoring to co-operate and to consolidate our shipments as far as we possibly could, and by so doing to offer to the railway people there a sufficient quantity of goods at a time that would justify them in supplying us with suitable accommodation and in making an effort to give us a service that would be satisfactory. Now we can increase that, and as our acreage and output increases year after year that objection will be less and less; but it certainly is at the present time one that is quite serious. The same thing applies to the ocean service. We will be met time and again with the reply from the steamship companies, "Your trade is so intermittent and so uncertain that it does not justify us in going to any large expense in providing for it;" and part of the season of the year when we require accommodation all other classes of people are clamoring for the same thing. The only solution of that point is as I said, the various sections co-operating, the growers having mutual confidence in each other and endeavoring to assist each other in providing for the transportation companies a sufficient quantity from time to time that will make it worth their while to cater to our wishes. In connection with the question of rates, I may say that at the last annual meeting of this Association a committee was appointed to confer with the transportation people in an effort to secure better rates. That committee was quite a large one, consisting of Mr. E. D. Smith, Mr. Carpenter, Mr. A. H. Pettit, Mr. Murray Pettit, Mr. Orr, the Vice-President, Mr. McNeill, of Walkerville, and myself. We had several meetings, discussed the question fully, and then having done so met with the Traffic Association at Toronto, presented our views before them, asking for certain reductions in the freight charges. We did so on the ground that the fruit industry had never yet received any reduction in freight charges, and that owing to the largely increased output of fruit, that fruit at the present time was deserving of some consideration from the railway people, particularly in view of the fact that there was scarcely another industry that had not in some way or another been recognized by the railway people and had received some concessions. We presented before that committee a series of requests, which I may just as well read at this juncture. Having gone over the classification of freights we found that fresh fruit was classed at the first class in carload lots; that there was no classification for fruits in cases or boxes for export whatever, but that if they were shipped in that way they must necessarily go under the first class; that grapes that had been shipped for wine purposes—that had been originally under the fifth class—had been restored to the third class; and that apples in barrels for shipment in Canada were at fifth class at that time. Looking over these particular items we felt that in connection with these various points we had reasonable grounds for asking for concessions, and consequently we asked that these particular lines of fruits be reduced materially in the classification. I may say that the Traffic Association took that matter into some little consideration, and for the present we were unable to bring pressure

enough to bear upon them to succeed in getting them to give us the concessions that we asked for, and that we considered reasonable and just. However, they made a concession that from that time grapes only should be reduced one grade in the classification. Now, that concession would amount to from $10 to $12 per acre on every acre of grapes that went out of the Niagara District and the Essex District, on the basis of the Montreal rates. That is the amount of the concession we have got up to the present time. Having received that information from the Traffic Association, we applied to them again to have that concession applied to mixed fruits, no matter what they might be, not to grapes only. Up to the present time we have not succeeded in having the railway people agree to that point. I feel that in connection with this matter of transportation and rates we are but on the threshold; that the prospects of improvement are very bright in both ways; and not only that we feel we have a just claim, but that the attitude of a good many of the railway people is in our favor, for there may be opposition from those who may be more particularly interested. Still it has been stated to me by our railway people that they consider our claims were just, and that the railway requires only a little more determination on our part, probably a little stronger pushing of the matter to the front.

Mr. HUGGARD: Did the committee discuss the question of local rates from the separate points on the railway? For instance, the Hamilton and Grimsby people have facilities that the people of Whitby do not. That is to say in smaller quantities than a car load, you can ship cheaper from Hamilton to Montreal than we can from Whitby. This is a very important matter to us along this line. I quite agree with the sentiments expressed. As it presents itself to us here, it seems that the rates are greater from here to Montreal—so much greater than from Burlington and those points, that pressure should be brought on the railway people to equalize it in some way. As a matter of fact, this last season California grapes were landed in Montreal at something of a less rate from Chicago than they were from Toronto; and this should be brought to the notice of the Grand Trunk.

Mr. BUNTING: I may say in connection with the question of local rates, or less than carload shipments, that the railway people are very reluctant to interfere with the less carload rates in connection with our fruit shipments. They consider that less than carloads rightfully belong to the express companies, and do not wish to interfere in connection with that matter. That is the argument that is brought to bear. As far as concerns the rates being out of proportion on the shorter distance, I do not think we took that matter into consideration. I do not think we had any data given to us in connection with that matter, and it will be one for further investigation.

Mr. HUGGARD. I would like to ask, too, whether the committee investigated the charges that the express companies choose to put on us. It simply amounts to this, that when our goods land in Montreal, unless there is a pretty good market there the express company gets about the whole of it; and we want to stop this—we want a little share of it here. The rate from here to Montreal is simply ridiculous as compared with the freight rates on the Grand Trunk. As a matter of fact most of the fruit shipped from Whitby station this year went to Montreal, and in some cases took five or six days to get there, which is ridiculous too; and I think this ought to be discussed, especially with regard to perishable fruits.

Mr. CASTON: I will move the adoption of the report in order to bring it before the meeting. This is a very important subject, indeed. We all realize the difficulty this committee has to deal with, and we must not expect too much from them at once. It is a difficult matter to deal with a large corporation. It is a well-known fact in regard to the short haul that the situation is this; the long trunk lines are competing for through traffic, competing to such an extent

that the profits of through traffic are very small indeed, and they are making the dividends out of the local traffic and the short haul. That is the exact state of things in this country to-day; therefore this committee has a difficult matter to deal with in getting the reduction of local rates. But it has a great deal of work ahead of it, and I think that committee ought to be continued. There is not only the question of railway and express transportation, but I think this committee will be able to effect something better in the way of improved conditions for the ocean transportation for freight. It appears to me a shame and disgrace that so much of our fruit, even that which is well packed—leaving aside the question of fraudulent packing—arrives in the Old Country so-called "wasted" and "slack" and "wet." Now, we have a better route from this country than from any other, and if we can get the steamship companies to give us the temperature of the ocean air itself, our apples would carry perfectly well. Why should they deteriorate so much in the short space of say two weeks in their passage across the Atlantic? There is something seriously wrong there, and if this committee can do anything in that line they will be doing a great service to the fruit growers of this Province, because it is getting to be a very important part of our industry.

Mr. SCARFF seconded the motion to adopt the report.

A. H. PETTIT: The object of this committee was to get our goods classified differently. Whatever class our goods are shipped under, carries with it a certain rate. We were not dealing with local rates or with express companies, but with all the railways of the country for the shipment of fruits of all kinds, and to change the classification from No. 1 to No. 3, or No. 3 and No. 5 to a different class; and whatever class you get in, that carries the rate. The work of the committee was quite different from going and getting special rates for this locality or that locality to ship their goods. It is a rate that covers the whole business with the railroad companies, and all railroads.

E. D. SMITH: As a member of that committee, I with the others met in Toronto and discussed this question in all its bearings pretty well. It seems to me that for a number of years we are wasting ammunition in attempting or expecting to do very much in compelling the railway companies or steamship companies. We have been doing that ever since I have been in the fruit business. We went there with a very strong case decidedly, but as Mr. Bunting has said, all the railway companies are organized in an association called the General Traffic Association. You can not go to them individually and ask one to do something in order to get freight away from the other company. They are so combined and united that they practically have the situation right in their own hands. They have us in their power; and although this committee secured a slight concession, it was just, as I looked at it, a little sop thrown to us to pacify us. It did not amount to very much. It was worth the effort, though, and it may be worth while to continue it, and urge them, and get little sops thrown occasionally to help us out; but I think we shall never with regard to railway rates secure our just rights any more than we have with regard to the accommodation on steamships so long as we depend entirely on an appeal to their generosity. Corporations, as is often said, have no souls. They look at it entirely as a matter of business. They have this trade in their hands, and we cannot help ourselves. We must take the rates that they offer to us. Now, there is only one way of getting what we want, and that is by compulsion We want to look around and see what lever we can get hold of that will move them; for compulsion, as I have maintained for many years, is the only thing that will affect the railway or steamship companies; and the only compulsion that I know of is the Government of the country. We have heard a good deal for years about appointing a railway commission. It seems to me that is the only relief we can get from the railways. We should have a commission conducted at not too great an

expense, before whom we can lay our grievances, and who would have power to compel railway companies to make fair rates,—that is, fair to all parties,—and not charge fruit growers excessive rates because they are scattered and distributed, and have not got a pull or lever that some other industry has. This commission could compel to give fair rates to all parties, and reasonable rates taking into consideration the length of the haul. It has been said here to-day that the long haul pays the little profit, the short haul pays the big profit. You know gigantic efforts have been made in the United States to overcome that difficulty, and something has been done. Possibly by means of a railway commission something could be done here, A much greater grievance—though I understand you do not wish to discuss that now—is the ocean transportation. That is a matter of very much more importance even than the railway rates, and the only way to get at that is through the Government. Would it not be advisable for this meeting to point out the way in which this committee should act, and the lines on which they should go? It might interfere with the results we might achieve, if we were to attempt to take up the local rates from different local points.

Mr. CASTON: Of course there is this difference that Mr. Huggard did not take into account: Here there is only one railway, whereas the Hamilton people have the competition of two railways.

Mr. BOULTER (Picton): We have had experience in our Packers' Association of which I am President, We were handicapped in the exportation of our goods to the old country. At first very little was conceded, but we approached them and kept at them until we succeeded in getting the classification changed, which made the rate a little different. Do not give up. We did not. When we could not get our goods to Montreal by rail from the local points for the rate, we shipped by water, and got rates then from Montreal through. Put men on your committee who will take the time and work and interview this Traffic Association. We got our classification reduced, and we also gained on our local traffic. We got a rate to Vancouver or Victoria, also to Winnipeg, the same from all parts of Canada—the same from, Montreal, Toronto, Picton or any other point. Now, I would not give up trying to get better rates. It is rates that guide and govern the success of the men in any business in which the old country is the market. I would like to see an efficient committee hammering away on that business; but the whole point in getting a good rate is getting a good price at the start.

The motion to receive and adopt the report was then put and carried.

The SECRETARY: I would move the continuance of the committee for the new year, Messrs. Bunting, Pettit, Smith and Carpenter, and that they have power to deal with both ocean and railway transportation. It will be interesting for you just now to hear the resolution agreed upon regarding the former, a copy of which was forwarded to the Dominion Minister of Agriculture.

"Whereas, the accommodation on Atlantic steamships has hitherto been unsuitable to the carriage of our fruits, even such hard fruits as apples being ruined in transit and arriving in the British market in an unsalable condition, although in perfectly sound condition when packed and shipped, and

"Whereas, the lack of ventilation, and the great heat in the holds of the vessels, added to the heat arising from the fruit itself, contributes to this evil, which has resulted in immense losses to the fruit growers in every Province of our Dominion.

"Therefore, resolved, that we memorialize the Department of Agriculture at Ottawa to take steps to remedy this serious condition of affairs, and thus give encouragement to one of the most important branches of industry, and that inspectors be placed at the more important ports, as Montreal, St John and Halifax, whose duty it shall be to see that such ventilation is attended to, and, further, to insist upon proper care in handling, loading and storing of our fruits on shipboard.

"Further, that, when cold storage for fruit is provided on shipboard, the steamship companies shall be required to guarantee that the temperature will be kept within certain limits, and that the same be verified by a self-registering thermometer placed under government seal."

Mr. CASTON: I second that motion. We have overlooked our very important home markets. We have a large market in the Northwest, and there is the question of transportation there—whether we should use ventilated cars or ice cars

to see that there are proper facilities for re-icing those cars and delivering the freight in proper condition. There are great complaints coming from Winnipeg, Portage la Prairie and those western cities as to the manner in which fruits arrive from Ontario. That is a question that would come within the purview of this Committee as well.

The motion to re-appoint the Committee was carried,

COMMERCE IN LARGE FRUITS.

Prof. J. W. Robertson, of Ottawa, said: Mr. President and Gentlemen: I regret very much that other public duties kept me from being here to profit by the discussion that has taken place on the transportation of fruits. Transportation is a very important part of commerce, but not by any means the most important part of the commerce of fruits in Canada. If I may say one or two words in regard to commerce in general I think you will be in a better position to understand what I would like to indicate; and be better able to learn from you what our department needs to know from the men who are practically engaged in this business. Commerce is the exchange of things—of commodities. It is not a mysterious philosophy. It is the exchange of commodities—something for something. That is not stock-broking, and is not speculating in shares. These phases of business operations may be right or wrong, but they are not commerce. Commerce is essentially the exchanging of commodities. One of the essentials for success in commerce is to have a commodity to exchange which in itself will get you a relatively large value because it is in good demand or in other words because many people want it.

In making the exchange, transportation comes in; and the better the transportation the more easily can the exchange be effected; but it does not necessarily affect the *essential quality* of the commodity you have to offer or of the money you may get for it. Unless the two—the commodity and the money—are good at both ends, safe commerce is impossible. I need not discuss safe money, because we have in the British Empire no question of the soundness of pound or the dollar. (Applause). The question is to get enough of them. (Laughter).

Fruit-growing in Canada has been adopted by a great many people who have not taken any trouble to learn how to carry it on. One has merely to look at the fruit trees that dot the face of the country to see that that is the case. It is shown by their kind, and their condition, and their general behaviour. There are some orchards that denote skill on the part of the man who manages the orchard; but for each such orchard I think there are ten orchards which are left to take care of themselves. The powers of nature take some care that the tree will be hardy and have some kind of fruit that will have seeds to reproduce it. The fruit-grower is after another object. He is after fine fruit to sell for a good price. The fruit-growers have been chiefly growing the varieties of fruit that grow easiest. Those may promise them a chance to hit any kind of market at any time of the year. We have too many men who have "loaded" their orchards to hit anything in general, but no market in particular, therefore they don't hit any market in particular.

We need to have a few sorts and varieties of large fruits, and these in reasonably large quantities in each locality, else the general commerce in large fruits cannot make progress. Let me give you an illustration of that. We find Canadian markets during most of the fruit season filled with fruit from the United States. That's the fact. Why is it so, when we in Canada say we have more fruit than we can take care of, and are looking for outside markets—

outside markets, with the very same sorts of fruit? The United States fruit that comes here has a uniformily good appearance throughout the package. That is worth a great deal. I talk to my friends in Ottawa, "Why do you buy those Californian fruits?" "Well, the fruit in the case is all the same." I say to the shopkeeper, "Why do you buy these?" "Well, I have no wasty ones in them; they're all alike." These two specific reasons, you see, are at the very threshold of commerce—are put there by the men who have the money to give in exchange. I mean the shopkeeper and the consumer. The Californian fruits have good keeping qualities. We may think that our climate and soil give a far better flavor, and I think they do in nearly all sorts of fruits; but the consumer says, "I want good-looking sound fruit, that is fairly uniform all through the case."

I come next to deal with the personal, particular market. There is such a market in every town in Canada, which the fruit-growers around these towns should be able to supply. The commerce of the locality is worth looking after. It is far better worth looking after than the commerce in the foreign markets. Every town in Canada would consume twice as much Canadian fruit if the people could get Canadian fruit of uniformly good size and good quality—not at a lower price; that is not the point. They are able and willing to pay a higher price than they have been paying. The question is one of fine quality throughout the whole package, with every fruit in good condition. The home, the house market will take all kinds of fancy, large fine fruits at double the price of the general market for export. I am talking of the town I live in and other towns. Why not meet that great unsatisfied market, and grow especially for it. That is where the money is made mainly.

Then there is the general home market—I mean the market that is like our wheat market, the general market for the general good quality. The market of the North-west and Manitoba is a large market and a growing market for Canadian large fruits; but if any of you went to Manitoba and tried to reason with a Winnipeg man as to the desirability of taking Ontario fruit instead of United States fruit, he would smile and tell you he knew his business, and that you didn't; that he had tried Ontario fruit many times and that there was so much loss and waste that he could not stand the risk, and he wasn't going to try it again. I don't know whether what they say is all correct, but they are the men who have the money. They are unwilling to exchange what they have for what we want to give them, and that is what they say. I have personal letters from men in the North-west, and they say, "We bought a barrel of Canadian apples, and the top looked nice, but the inside wasn't the same." That is what they say. (Laughter). I don't know how it comes about that the small, inferior apples gather in the middle of the barrel. I have never been able to account for it except in the light of a paper read at your annual meeting in St. Catharines which explained it admirably and completely. The fruit-grower assured us that ever since Eden the devil personally inhabited each individual apple, and then moved his habitation about after he got in the barrel. (Laughter). I don't know any other way of accounting for it.

I want to get your minds on the line of our greatest need for improvement. I have been hinting at these things—a uniformly good fruit all alike throughout the package; uniformly sound condition, with good-keeping qualities for the shopkeeper and the consumer; and then excellent superior quality for those people who are willing to pay extra for such. For the general export market we need similar improvement. Every mail that comes from England brings me word like this: "What we want in Canadian fruits first of all is soundness and good-keeping qualities, and nearly uniform size throughout the package." That is what they want. Then they want also a nice appearance—as large a size and as fine a color and as good a shape as can be had. After that they want fine flavor. I have

letters here saying that the Keiffer pears were taking better in the market last year than before. Now, who is going to stand up and brag about the Keiffer pear for quality or flavor or flesh? But for sound-keeping quality they are quite the thing; and that is what the commercial men who have the money say about that pear—that it is taking better this year than it did the year before, and there is a reasonably good prospect for it. If we can get an equally good-keeping pear and equally good-looking pear, or a better-looking pear, with superior qualities of flavor and flesh, that is the one to send. I mention the Keiffer just to show that they are after these things first—soundness and good-keeping quality.

The Department of Agriculture made trial shipments this year. I shall make a few brief observations on them. These were trial shipments mainly of pears, of peaches, and the more tender sorts of apples. We sent altogether only 127 cases of peaches, 3,746 cases of pears, 1,456 cases of apples and 82 cases of quinces. The main shipments were pears and tender varieties of apples. The peaches were packed in cotton batting, so as to protect them against any possibility of bruising, and also against the warm, damp air of England when they were taken out of cold storage. Here are the returns,—not very good in some cases. We sent not more than 30 cases at one time, except in one late shipment. Twenty-eight cases were sold for $2.46 each, and realized at Grimsby net, after all expenses were off, $1.68 per case. These were specially selected peaches. I find I have not got here the exact weight of the peaches; perhaps Mr. Pettit can tell me.

Mr. PETTIT: I don't think I could tell you the weight. There were 64 peaches in each case.

Prof. ROBERTSON: The weight would be not more than 15 pounds of peaches?

Mr. PETTIT: Somewhere there.

Prof. ROBERTSON: The next lot of peaches, 30 cases, sold for $2.99 each, and netted at Grimsby $2.31 after all expenses and commission were taken off. Then 53 cases were sold at $1.46, and netted 92 cts. at Grimsby. I will read you an extract from only one letter in regard to that. This is from the consignee in Covent Garden: "You will notice the good prices we made of peaches"—that was that second lot. "We must say that whoever packed those did his work well. They arrived in splendid condition, and have of course met with good results. We think the Elberta peach is the finest, and ought to do well in this market." We have not had much success in a general way in shipping Crawford peaches yet. That shows there is an opportunity in England now for peaches—for small quantities—if put up in such a way as to be carried safely and to have an attractive appearance when they are delivered.

Then in regard to the trial shipments of pears. The returns from the pears vary very much, partly owing to the size of the pears and partly owing to the condition of the pears as to ripeness. Some pears were landed a little too ripe, "dozy"; and then later shipments of pears were landed too green. With some, we hit it just right. We had some that were landed just right, some that were landed too ripe, and some too green. Pears should be picked when the pips are about to turn brown. In the case of the very early and tender pears, they should be picked *just before the pips turn brown.* If the late pears are packed in that condition they don't ripen on the way, and when the English buyer cuts the pear down and looks at that part, if the pips are white, unless the pears are very fine he does not want them. If the pips are too brown he says they are going toward decay, and they go into the hands of the jobbers. A very early and tender pear should be picked at an earlier stage of ripeness than the later pears which don't ripen so quickly. We all know that as a principle, but we have forgotton to put it in practice in the actual management of the shipping business. Here are the figures of one of the early lots; 55 pkgs. pears from Mr. Woolverton were sold for 86.4 cts. and netted 50 cts. at Grimsby. The packages held about 16 or 18 pounds; the large ones a little more than that. The

report to me from Manchester was that that was the actual weight of the pears. 95 pkgs. from Mr. Van Duzer were sold at 93.7 cts. netting 52.6 cts.; and 145 pkgs., specially good, were sold in Manchester for $1.97 and netted in Grimsby $1.54 per case after all expenses were off.

Mr. PETTIT: What kind were those?

Mr. VAN DUZER: Bartletts.

Prof. ROBERTSON: The fruit shipped by J. D. McKinnon & Sons sold as follows: First lot, 74 pkgs., were sold at $1.07 in London, and netted 65 cts. in Grimsby; second lot, 77 pkgs., were sold at $1.21 in Manchester, and netted 82.2 cts. in Grimsby; third lot, 65 pkgs., were sold at $1.19 in Bristol, and netted 71.1 cts. in Grimsby; fourth lot, 60 pkgs., were sold at $1.23 in London, and netted 64.7 cts. in Grimsby; fifth lot, 11 pkgs., were sold at $1.90 in London, and netted $1.34 in Grimsby; sixth lot, 32 pkgs., were sold at $1.07 in London, and netted 64 cts. in Grimsby.

These differences seem inexplicable, but the correspondence and my reports from Grimsby and from our own agent in London, indicated that every time when the pears were superior in quality, in size, and just right in condition, they fetched extreme prices and there was a great demand for them; whereas when the pears were small in size or not in good condition they struck a poor market. If you read the correspondence you would see the reason for the extreme differences in price in the same markets for fruit from the same shippers. Here are the returns from A. H. Pettit & Son: First lot, 6 pkgs., were sold at $1.59 in London, and netted $1.14 in Grimsby; second lot, 5 pkgs., were sold at $1.22 in Manchester, and netted 83 cts. in Grimsby; third lot, 15 pkgs., were sold at $1.21 in Bristol, and netted 72.6 cts. in Grimsby; fourth lot, 80 pkgs., were sold at $1.14 in London, and netted 55.5 cts. in Grimsby; fifth lot, 242 pkgs., were sold at $1.97 in London, and netted $1.40 in Grimsby; sixth lot, 132 pkgs., were sold at $1.60 in London, and netted $1.14 in Grimsby. The larger the lots the better they sell. If I were to quote you all the large lots only I would give you the best prices in every market. I mean, an appreciable quantity will fetch higher prices than five or six cases of a sort. All you want at this meeting are instances giving general information.

I want to read a few letters in that connection. This is from the consignee in Covent Garden, London, in regard to the size of the pears:—"We notice that most of your fruit is small. Now small fruit on this market does not sell well. It must be large, bold, clear stuff. That is the reason of the success of California pears." Now, that is the same firm that sold pears of ours later on at good prices when we sent them what they wanted. "We think the size of pears you send should be no smaller than 60 or 62 in a case. When you get them up to 100 and 122 in a case, that is very small." I would like to read you one other brief reference from *The North of England Fruit Brokers, Limited,* of Manchester:—"The quality of those you sent was most excellent, especially the Clapp's Favorite, but there will have to be great improvement in the cold storage arrangements for transit, and much more care exercised to make the temperature suit the fruit, maintaining the same degree all through the voyage. If they could only be put in this market in the same condition in which they are put on your markets good business will be done." That is in regard to the first shipment. Later reports say even from their standpoint the cold storage was all right. The fault was not in the cold storage; it was in Montreal in this case, where the first shipment missed the steamer and then had to be held over for the next steamer. It was the holding of them that caused that over-ripeness. Then from W. N. White & Co., of Covent Garden:—'The Duchess pears have also done well. These hardy sorts of pears are sure to do well. There is not the same danger in shipping. As regards what you term French pears, there is no use sending them again here. They are what we call Bonne Terre and should come much later in the year. I

cut one in two and saw that the seeds had not turned black, showing that the seeds were not properly matured." Then also from the same firm:—"From experience we find that the pear is only fit for pulling when the seed is just turning black. If it is picked when the seed is white there is no keeping quality in the pear. Care must also be taken not to pick it over-ripe. The seed must be just on the turn." These are large handlers of Canadian and French and Californian fruit. One thing more from the same firm, enclosing a cheque for the proceeds:—"We have already cabled you the net results and also the prices realized for the Duchess pears. These did very well indeed, and large clear fruit will always do well. The Keiffer pears were also in good demand, but the peaches, with the exception of Elberta peach, are not much of a success. They seem to eat very harsh, and there is not much juice in them. The Elberta is much the better peach." Then a letter in reference to the last shipment:—"We have already written you our views on these pears, and think if next year regular supplies are kept up they will do well, especially the Duchess pears. The Keiffer pears will also do well on being better known." (Laughter). I am not offering you any casual opinion of my own; I am offering you the judgment of the firm that has been sending us the money for that fruit—the exchange we want. Now if they are willing to exchange good English gold for Keiffer pears, let us give them enough to get a good exchange.

I have only a little to say about apples. We sent over altogether 1456 packages. They were all landed in good condition. Nearly all pleased well, but there was a common complaint that the packages were much too small. The Department was willing to let the shippers have their own way, and I also, with the shippers, was willing to make trial whether we could send fancy apples in small packages and make a good trade of it—I mean packages so small that they were about from 14 to 16 lbs. net of apples in each. We found these too small. They netted some fair prices considering the size; but still they did not pay. Taking off the expenses, which were very heavy, these small packages netted anywhere from 5 or 6 cents up to 21 and 25 and 30 cents, which after all is a good price for 15 lbs. of apples. A forty or fifty pound case is the case that they want as a minimum for fancy apples. We sent some half bushel and some bushel cases. Here is one report:—"Apples. Speaking generally we beg to say that in our judgment these boxes are much too small for apples. We think apples should never be put at this time of the year in boxes containing less than 40 lbs. That is still a small package. For the last six weeks very large quantities of English eating apples have come in our market and been sold at an average of six shillings per hundred weight, which were quite as good a quality and better condition than the shipped ones. Our English apples have not the colour that yours have, but we are inclined to think that the expense of wrapping them in paper and putting them in small packages, as was done in this case, is at this time of year inadvisable." The same people wrote me later,—a letter which I received only yesterday. It is not confidential, therefore I use the names. "By the ss. Manchester Trader we received from Messrs. Pettit & Son, and Mr. Andrewes, of Grimsby, Ont., consignments of apples in boxes of about 45 to 50 lbs. gross. The quality and size were really good, and such will always command good prices. We have written Messrs. Pettit and Andrewes advising them to send all they can if they can ship the same quality and size, as we feel sure they will do well. We should be pleased if you would advise any of your shippers if they hold this A1 stock to ship it here, packed in 40 lbs. net boxes, and the apples wrapped in tissue paper. It is no use sending small or medium sized fruit, as there is plenty of this kind on the market." Those apples, looking down the sales, sold from seven shillings, and in fact one lot of seven cases as high as nine shillings—from nine shillings down to 4s. 9d. per case for everything except the samples. Those are substantial good prices for 40 lbs. of apples.

Mr. CASTON: What would they net at Grimsby?

Prof. ROBERTSON: At the same rate of expense as the shipments made by the Department, a package that size would cost about 40c. for transportation and selling expenses. The freight charges varied according to the rates that prevailed on the ocean, and also as to whether a full carload or not was sent. If they sold for 7 shillings with 40c. to come off, they would net about $1,28 per box.

Mr. CASTON: That is about a third of a barrel, that 40 lbs. of apples?

E. D. SMITH: A little less.

Prof. ROBERTSON: I should think those apples would net about $1.25 a box at Grimsby,—perhaps a little better. That particularly fancy apples in fancy cases will fetch a fine price goes without saying. I have a letter here from London dated November 22nd., and Mr. R. W. Sheppard is also in the hall and he will let me give away, I know, some of the information about his business that came to me through another channel. This is what happened. I wanted to have three cases of very fancy apples sent to some friends in London, and I did not get word of that until all our shipments from Grimsby had been sent forward and disposed of. I wrote our agent to get three cases of fancy apples in London as cheap as he could and as good as he could, and send them with the compliments of the Canadian friend to these people. He wrote me,—"Sheppard's consignment of Fameuse apples arrived only yesterday. I had three cases sent as directed. I have written to each of the parties to whom the fruit was sent. The fruit is very fine, and so is the price, which was 21 shillings per case, and 1s. 6d. each case for carriage. The apples are retailed at 1s. 8d. per dozen." That is quite a price. This letter says 21 shillings a case, and it is rather a favour to get them from one of the largest concerns in London, that has an almost unlimited demand. The case I suppose holds about a bushel.

Mr. SHEPPARD: A little more; 196 apples.

Prof. ROBERTSON: This same letter says:—"On last Monday I called on several large firms in Bristol and saw a lot of Canadian apples, and I felt ashamed of my country. They were slack, wet, not well graded, dishonestly packed, many barrels being topped with good fruit, filled with perfect rubbish of many varieties. I counted 25 varieties on the bill of lading to a consignment of about 100 barrels. Some of the barrels have more than one variety in. The Elder, Dempster people were offering Fameuse apples"—(those were Fameuse that we paid 21 shillings a box for)—"were offering Fameuse apples for six shillings a barrel, and could not get even that price—large barrels." Compare that with Sheppard's 21 shillings for the box holding a little over a bushel! Now I need not say anything further to emphasize the value of selection and quality and condition and packing and package for getting a big price and an almost unlimited demand.

Mr. President, I now put all these account sales and things to one side. I have not given you a great deal of detailed information. I have given you, perhaps, what is better; I have given you impressions as to what the conditions are and what the possibilities are in regard to tender fruits. Each man must work out the methods for himself in his own locality. I now pass on to mention further what I think are improvements required for and in the commerce in large fruits. First of all, for the export trade there must be comparatively large lots of one sort and of one variety—not too many varieties in a single consignment. Then there must be fine quality and fine condition. The apples, specially, must be large and uniform and sound. Nature does not provide them of that sort on the trees. They are not uniformly large, and they are not uniformly fine in appearance, and they are not uniformly sound; but it will pay the shipper to send to the English market only those that are, and do something else with the others. There would be more money come into the country by sending out only the uniformly good fruit. (Hear, hear.) The fruit must be fine in regard to

flavor, if we are to please and keep the trade permanently. There are one or two ways for the apple trade to gain that end. One of these is that the orchards shall be so large in their production that the individual grower can meet these conditions himself, by having reasonably large quantities of each good variety he ships. If the grower of the fruit be not in a position to do that, then there must be a central packing and shipping place for the locality. I don't see any other means of putting this trade on a basis that will make it profitable commercially. Our cheese trade, which is bragged of a good deal, and perhaps deservedly so, will bring in something over $19,000,000 this year. That is a reasonably large sum, and has grown from under $6,000,000 within my recollection and active connection with it. That has been possible only by the trade being on this basis: the production of uniform quality at the factories, and then the handling of that by competent commercial firms that select carefully and send only to each market what suits it. When Canadian cheese is quoted at a price, it is bought on this side and the money practically sent here for it; it is not consigned, as a rule. The possibility of that begins when the quality is of a standard sort, and is uniform throughout each lot; otherwise the men on the other side will not buy; they will compel consignments, and consignments of irregular, inferior goods spell ruin. Now, our butter trade is getting on as good a basis as our cheese trade. In 1894—that is not long ago—the exports of butter from Canada were worth about $600,000; and this year, because of more systematic manufacture and safe transportation, the exports will rise to probably $5,000,000. I think they will increase $2,000,000 further next year. That seemed impossible four years ago, when people said: "Oh, you have no business sense, or you would not talk of those possible increases." If you put the business on a safe commercial basis in regard to the production and the selection, and the handling and transportation, the English market will give you any amount of money for the right quality of food products. I mean they have the market and they have the money. I merely instance what has been achieved in those two products by these methods.

The transportation on the ocean has not been of the best yet for either apples or tender fruits. It has been gradually getting better than it was. And now for the tender fruits. This is in contemplation for the next season: Instead of having large cold storage chambers—which were all we were able to provide for three years ago, because the steamship owners then would hardly do anything, thinking the business was not worth encouraging—we will be able to arrange for small cold storage chambers of from one to four carload sizes, so that tender fruits can go in a chamber by themselves and be treated as they ought to be, instead of going in as a side accommodation in a butter chamber. But we could not get as far on as that until this year. Now the Minister of Agriculture has arranged for small cold storage chambers on the ships, in which the temperature can be kept from freezing point or below freezing point up to any temperature required. The steamship companies say they will provide ventilated holds for apples. But providing these facilities does not ensure that the fruit will get the benefit of them; and there's the rub. There is no blinking that. I listened last year with a good deal of interest to the discussion which resulted in the appointment of a Transportation Committee of this Association. There are cold storage cars on the railways, and there is plenty of ice in the ice-houses along the lines, and there are cold storage chambers on steamships; but these things don't act themselves—(laughter); they don't bring about anything. All the Government can do, I think, in the matter, in the commerce of things, is to help to provide the facilities, and then the man who has the stuff in his care and at his risk may put the agencies into operation. Take the cold storage in railway cars for butter. It took three years to educate everybody—the railway agents and the men in Montreal, and other men. Cold storage is a business that requires trained men to mind all the

little things about it. And now the individual fruit grower must look after his own fruit as long as he has any risk in it, no matter what conveniences or facilities the Government provides, because the carelessness of those who handle it may prevent the facilities from being useful to the man who ships.

The unfortunate position of the apple trade is due to one of two causes, and even to both causes combined—not only bad transportation and not only bad packing, but sometimes bad packing and poor transportation combined to do the greatest possible damage to the business. One of the main causes of loss, however, is the want of skill in packing apples. I suppose everybody is born with ability to do a great many goods things. I know most men are born with a consciousness that they are able to judge horses and make good speeches and run for parliament—(laughter)—only sometimes they don't get the chance. I hope no fruit grower will believe that he is born with the ability to pack apples by intuition. It is a business that needs particular painstaking in the learning. I don't know yet how to pack apples. I have not packed many barrels myself—perhaps 20 or 30 with my own hands—but I have supervised the packing of a great many more, and I don't know how to pack apples. I don't how to make horse shoes; I don't how to make doors. I haven't learned the business. Do you see? I want to lay down the proposition that a man doesn't know how to pack apples until he has learned the business of packing apples. You don't know it by intuition. You have to begin by learning a little, and then adding to the experience a little more, until you know how to pack apples. By that process we would have a lot of trained men and women and boys able to pack apples. Then there has been great want of care, as well as lack of skill. Then there has been want of honesty. That ugly word dishonesty will somehow thrust itself in before the man who is examining our apple trade. He says to himself, "I mustn't say that because I will offend a great many Canadians." I was told when I went before the Committee of the House of Commons a few years ago, "You mustn't say anything reflecting on the honesty of the fruit growers and farmers, because everybody will be down on you." That doesn't make any difference; because much as I strove against having any such opinion, the evidence would keep coming up and keep coming up in the most irrepressible way that there is, somewhere and somehow and very often, simple dishonesty in the packing of the fruit. I cannot put it in clearer English, and I can't put it any stronger than by saying these few words. Is there any proof? I told you what we did last year. I would not even try to thrust the proof on the Convention if it was not in the hope of making some amendment. I think the most graceless and useless undertaking in the world is to go about finding fault unless one is finding fault on purpose, and with some ability, to make remedies.

Last year we had a great many fruit growers saying that the damage to apples was all done on the railways or on the steamships or in the markets of Britain; and nobody seemed to know where the damage did take place. Last summer the Minister of Agriculture authorized me to engage two men to watch the condition of the apples, passing through the ports of Montreal and St. John, N.B., and Halifax, N.S. These men were not official inspectors—I mean they were not clothed with power to seize fruit—but they were Government employees to stay on the wharf and watch the loading of fruit in the ships, with instructions to pick out here and there average sample lots, examine some barrels and make me a report of what they found, with the name of the shipper and name of the consignee, with the number of barrels and the car numbers: Some of these particulars I am not going to give to this Convention. They were confidential to me as an officer of the Department.

The reports of the inspector at Montreal began on the 6th, September. He picked out carload lots and the following are extracts from his report on several lots. "Damp, and some barrels wet." That was in Montreal. Then on the

same day: "A good many No. 2 apples in this lot." That was another lot. Then on the same day, "Brand XXX 100" —I don't know if anybody here knows the brand—"some of the apples were very small." That is his report. Of course he found other lots: "Apples in good order and the weather cool." These were examined in Montreal before there was any chance of being damaged on the ship. In another report he wrote, "This lot is in good order, certainly small, but sound." And then, "packed loose." Then another lot, "badly spotted." Another lot, "badly spotted." Next, "loose packed." Then, "A. No. 1 fruit." Then the next lot, "Apples rotten and loose packed". Then the next lot, "Some poor and slack and loose packed." Next lot, "Fruit only fair." Next lot, "Fruit some spotted." Next lot, "Fruit A No. 1." Next lot, "Fruit A. No. 1 but small,"—and so on. I am giving you quotations from the reports on the lots that went on five steamships in those three days. I can do that now without any hesitation, because those apples have all been sold in England. These were apples shipped in September. Sept. 21, "Apples A. No. 1 in good barrels." Sept. 22, "Lot Blemheim Pippins rotten.' Sept. 22, "A. No. 1, but fruit seemed a little on the small side." Sept. 26, "Fruit A. No. 1, barrels very poor." Sept. 27, "Rotten fruit in good barrels." Oct. 2, "Fruit A. No. 1, barrels very poor." A No. 1, good barrels and well packed." Oct. 4, "Apples, fruit small and spotted." "Fruit poor and bad barrels." "Fruit A No. 1, poor barrels." "Fruit rotten and poor." "Fruit only fair." "Fruit, Pippins A No. 1; Snows poor." Each one of these refers to a different carload. Oct. 9. "Fruit only fair." Oct. 10, "A No. 1 but small.' "Fruit small but branded No. 2." " Fruit spotted and poor, also small." "A No. 1 fruit in poor barrels." "Badly spotted." "Badly spotted." "A No. 1 but small." "Next lot small but A No. 1." Oct. 16, "Rotten and others fair." "Fruit some spotted." "Fruit rotten, others fair." "Fruit rotten and wormy." "Fruit only fair." "Fruit only medium." "Fruit A No. 1 but too tightly packed." "Fruit No. 1 but barrels wet." "Fruit badly rotten." I am reading some of the worst ones.

E. D. SMITH: You are taking them as they run?

Prof. ROBERTSON: No, I am taking perhaps six out of twenty.

G. Y. Smith: Does it tell the kind of apples?

Prof. ROBERTSON: Yes. I am reading you the reports on from one quarter to one sixth of the whole number of carloads examined.

E. D. Smith: Taken indiscrimately?

Prof. ROBERTSON: Taking more of the poor ones. The inspector had no official power to disturb the fruit very much, so he did not disturb the barrels very much. He took a few apples off the barrel and looked down in them. Then, Oct. 23, I will read you the comment on each lot in this report straight through:— "Fruit all No. 1." "Fruit only medium." "Fruit A No. 1, good barrels." "Fruit A No. 1." "Fruit poor and rotten."" Fruit A No. 1." "Fruit very poor." "Fruit A No. 1, good barrels." "Fruit very poor."" Fruit poor stuff." "Fruit rotten trash." "Fruit A1." "Fruit A 1." "Fruit fair." "Fruit poor and bad barrels," "Fruit only fair." Fruit A No. 1, good barrels." That is the summary of all the carloads reported on that one sheet.

I will read you only two extracts from the inspector at St. John, N. B., and Halifax, N. S.,:—"The ventilation in most of the ships might be fairly good if only such care in looking after it could be secured as most people give to the preservation of their own property. Extreme roughness in the barrels, received in the unloading from the cars as well as in the stowing of the ships, cannot fail to injure the fruit—(Hear, hear)—and it seems to me under present conditions very difficult to control. In St. John the apples are unloaded from the schooners alongside the steamer, and fare rather better in that respect than in Halifax, where they are unloaded from cars and then rolled through the freight shed that in wet weather is often very dirty, and the barrels get blacked up very much. This, however, is easily remedied, but certainly somebody should have more

control of the rascals that smash and tumble the barrels at their sweet wills." (Hear, hear). "Then the loading ot those steamers is done mostly at night off the railway. Barrels are rolled across the warehouse and loaded into the steamers outside. It is quite impossible in this rush to catch anything from the marks on the barrels." There is what you find, reported from intelligent, competent men, examining the fruit at our own ports before it leaves.

Now, it is not surprising that bad reports and bad sales come back from at least that class of fruit; and I have not picked on, and they did not pick on, any particular lots, but spent their time during September and October examining different lots—giving me a full report like that every week. There is something radically wrong, to allow so much waste and so very great loss, to go on in an important business like this.

I want to say a little now as to what the agent we had found on the English side. He also was an independent man, outside of commerce. This is in regard to apples. "Sept. 2,—A lot of Nova Scotia apples were sold to-day at from 15 to 17 shillings per bbl. and that in a market glutted with English apples of all kinds, including windfalls. I noticed barrels with a thick paper at each end, as I suggested in my report to you last spring. I noticed the barrels opened up with a much handsomer appearance than barrels without paper, which had a bruised, and in some cases a dark bruised appearance. Neglect of that little point caused shippers a loss of one shilling a barrel. The best Nova Scotian apples are far better than the Ontario boxed apples in every way." Nova Scotia apples are not sold as Canadian apples. As I pointed out to the Convention last year, in examining account sales the percentage of wasty and slacks in Nova Scotia apples was about six per cent., and the percentage in Ontario and Quebec —so-called Canadian apples—was something over sixty per cent.

A. H. PETTIT: What about the Nova Scotian barrel and the Ontario barrel, in the bilge?

Prof. ROBERTSON: They say the difference in the bilge of the barrel now is so slight that that cannot contribute much to the difference in the condition of the fruit.

Mr. CASTON: The Nova Scotia people are half way there; that is an advantage.

Prof. ROBERTSON: They have some advantage, and still they complain of the handling at St. John and Halifax, the rough handling; but the Nova Scotia orchards perhaps each produce a larger quantity of one variety than in Ontario. That is very important; and the Nova Scotia apples are nearly all handled by men trained to the apple business. Many of the London firms now have their own men and warehouses in Nova Scotia, and those that are not handled in that way are handled by large growers and men trained in the packing. These account for a great deal. I was speaking with a Nova Scotian grower the other day who for three successive years has done his own shipping from his own orchard, and his apples have averaged him in his orchard over $3.05 net per barrel, for three years' shipping.

DELEGATE: What kind of apples were they?

Prof. ROBERTSON: He has a good many Baldwins and Kings. He sprays five times a year, so that there are no spots. Two years ago he said he was astounded to find one man putting in small apples in a barrel—as the man thought, to help him out. He dismissed the man on the spot and gave him a dollar to go. That was told all around among his packers, and he says he has not had to dismiss a man since then.

This is from a report dated November 22.—"Nova Scotia fruit is well spoken of this current year, but the general opinion regarding Canadian apples" —(Ontario and Quebec Provinces)—"is that they are worse this year than ever. I am looking into the matter, and will report to you later. . . . I saw a few

barrels Canada Baldwins well graded and nicely packed, but they were very wet. I should judge the wet is caused by the barrels being stowed in heated holds without ventilation. I have not heard complaints *re* Nova Scotia apples being wet or slack. The manager of the fruit department of the Army and Navy stores told me this morning that Nova Scotia apples were very good, but Canadian apples were most unsatisfactory in every way, and worse even than last year." That is an unbiassed report, and it is along the line of the report from Montreal before the apples were on the ocean at all. So it does not seem to me that the blame lies on the ocean transportation for the poor apples and the low prices.

Mr. Caston: But there are a great many apples this year arriving in that condition that are well packed, owing to climatic conditions that were unusual.

Prof. Robertson: I have one more letter. This is from Liverpool. The agent of the Department goes to Bristol and stays a week, and then goes to London, and then goes to Liverpool and stays a week, and looks for himself, and finds what he can learn. This is what he says: "I called on Woodall & Co., Temple Court, Liverpool, *re Canadian apples* and they complain very much about the quality and condition; they sold a lot of Ontario apples for 1/9 per bbl. (gross) this week, (slack and wet). They find no fault with the shape of the barrel (bent staves) and prefer it to the Nova Scotia barrel. They account for the large number of slacks to the jolting on freight trains in Canada. The quality of apples they say is not so good this year, they are more liable to sweat and become soft, than usual. I asked them to send you catalogues of their fruit sales which they will do."

You see something of the condition of the apple trade. You knew it before I said anything. I have not come to give you information that is new to you all, but I have put it in the light of reliable and official reports received on this year's business.

I speak now with a good deal more diffidence, because this is a business with which you are more intimate and of which you are certainly better able to judge than I. I suggest this to your very serious consideration: Should there not be an application of some official, recognized standard for apples packed for export? Should not the standard first of all include some designation that the size of apples in a barrel are not less than so and so in inches? Should there not be some standard of size, so that a purchaser buying a certain grade may expect that the apples in the barrel will be all up to specified size? Then should there not be some definite standard of quality in regard to soundness, to shape, and to freedom from blemishes? And then should there not be some standard of variety? I mean some enactment providing that only certain apples could be legally called Kings and Baldwins and Northern Spys, and that no other sort of apple could be legally called by those names. I would like you to think that out. Don't we need standards for these three things? I don't mean that we should make the branding of them compulsory. Should we not have some reliable measuring guage for a barrel or other package of apples and pears? You could not do business if you said only to a man, "I will sell you a box of cheese at so much per box." It might be a big box or a small box. We need a standard for size and quality and variety.

Then let me make another suggestion. Do we not in Canada need some enactment that will require the branding of the name of the grower and the name of the packer on every closed package of fruit for export? (Hear, hear). Should we not require that? You say, "What business is it to the Government that a man should put his name on?" Well, the Government is a form of co-operation of all the people to make this a desirable country to live in: and if it becomes more desirable to do business in by having this done, and no individual's liberty suffers injustice, why not do it? If a man brands the names, John Brown, grower, William Smith, packer," on the package, and if he brands it, "A

No. 1 "—if that be the standard for size or quality—or if he brands it " Northern Spy " and any inspector in Montreal or any other port finds a barrel of apples of John Brown's or William Smith's with something else than Northern Spy in it, and something that does not come up to the standard represented by the brand, then let that barrel and all similar barrels be taken at once and sold for what they will fetch, and the returns put in the hands of a committee of fruit growers to suppress fraud in Canada. (Laughter).

DELEGATE : Why do you wish the grower's name ? He picks the apples and lays them under the tree. I don't see why his name should appear.

Prof. ROBERTSON : The object in putting the grower's name would be this : As far as he supplied good fruit he would get the benefit, from his own name being on the package ; if he had bad fruit he is not liable to a penalty, but the putting on of his own name, if the fruit was condemned would be a means of keeping him from selling to a packer who would dishonestly pack the next year. If you had not both names you could not trace the fruit so well. The grower is under no penalty in any case, unless he is also the packer.

DELEGATE : There is some poor fruit in every orchard, and if a packer takes them all and packs them I don't see why the responsibility should be on the grower.

Prof. ROBERTSON : If the grower lets the poor fruit go off his place mixed with the good he can't object to the buyer doing the best he can with what he buys ; and that is what is ' playing hob ' with the business. I am making only a suggestion, not even recommending this to you. You can discuss it. If a grower sells his orchard to a packer he is nevertheless the man who is most interested in the trade next year and during future years. Now, his name appearing on the barrel would not make him liable for anything, but it would make it possible to trace the fruit back and send him word that some fruit with his name on it was found badly packed and found so as to do the fruit trade of the country harm. It is for you to discuss these things. I suggest that the standard should include a designation for size, should include a description of quality, and should include a statement of the variety ; and then I would suggest in the next place that there should be compulsory legislation, that the grower's name and the packer's name should appear as such grower and packer on every package of fruit intended for export. Other countries do that now in regard to some other things, and they find it exceedingly useful—for instance, New Zealand in regard to butter, and other countries in other things. And then, in the third place, the suggestion as to whether it is not desirable to impose some penalty. Now I said " confiscate." My notes, which I thought out more carefully, do not say confiscate. But as to whether there should be some penalty imposed on any one having fruit bearing false brands, and if so, what the penalty should be. I suggest these three things to the Convention as being needed to put the commerce in large fruits on an honest and safe and profitable basis. I believe that the adoption of these suggestions would help in that direction ; and I thank you for your patient hearing. (Applause.)

THE PRESIDENT : I think we are on the right road to get at these difficulties in some way that we will be able to deal with them. It certainly is coming before us so very plainly, and the fact that so much of this fruit is in such bad condition at Montreal, Halifax and St. John is somewhat of a surprise. The idea that the fruit leaving this country would be in that condition at the port before shipping is something remarkable. It becomes more and more apparent that the fruit is fraudulently packed. These baskets that we have here, and these reports that we have, all confirm this. Now we will be pleasad to have any discussion of the matter. I am sure Prof. Robertson will be pleased to answer any questions that you may ask.

Mr. REID (Belleville): If I were a grower I would have no objection to my

name appearing on a barrel; but Prof. Robertson says the packer's name should appear. Now if the packer means the shipper, I think it would be all right; but if the packer is merely the packer working only as a packer, not the exporter, I do not think his name should appear.

Prof. ROBERTSON: By the word packer I did not imply the name of the workman who packed, but the name of his superior who owned the fruit. The owner who is responsible is the man I was after.

Mr. REID: The shipper.

Prof. ROBERTSON: He may or may not be. William Smith may grow, John Brown may buy, but John Brown may sell to a Montreal exporter. I want the names of the two men who are responsible for the condition in the barrel. Of course the buyer is the man I want—not necessarily the exporter, because the buyer might sell to an exporter.

A MEMBER: The man who is selling must sell to the highest buyer. He does not care for his name on the package; he wants the most money for his orchard. How is he to get over it?

Prof. ROBERTSON: If a man has an orchard yielding him 200 barrels it is to his interest to get the largest price he can for those 200 barrels; but it is far more to his interest that there should be a demand for future crops from his orchard, and that he should not sell to a man who would get his orchard a bad name or get the country a bad name. So that if a man this year sells for $2 to a man who would handle it at a profit, he will get that $3.50 by and bye. So the grower makes a huge blunder if he sells for a high price one year to a man who damages the fruit trade. That is why I want to see that the growers are interested even more than the shippers; because if it were not for this bad fruit we would have got into Canada this year at least—how much do you suppose? Well, I think a million and a quarter dollars more for the same barrels of fruit, as near as I can figure (Hear, hear), more than we have got now. Now, that million and a quarter dollar loss has done nobody good. Now, if we can get a million dollars some way, the farmers would get their share of it, and the railways and the steamships would get a share of it.

Mr. POWELL: The position which Prof. Robertson has given of the apples in your country is very much the same in my own. I have listened with a great deal of interest to the presentation of this question, and I must say that Canada is not an exception in this matter of large quantities of defective fruits sent upon her markets; and I have been extremely interested in this special investigation, which it seems to me is going at the root of this matter. (Hear, hear). What Canada is doing in this direction is going to benefit our entire country; and I want to express to-day in this association my great satisfaction in knowing that you here in Canada are taking a forward step to correct this condition of things, which certainly is a calamity for both your country and the United States. (Applause). There is no question that the consumption of apples can be increased in foreign markets 100 per cent. if we will only send our fruit there in a better condition. There is one point which I would make here, and this I think I made yesterday—we have to begin in the orchards for this better quality. We have got to begin right at home, and we must produce the least inferior fruit there. If inferior fruit in grown in the orchard it will find its place somewhere in the market; and so long as that exists, so long we are going to find difficulty and trouble in the marketing of our fruits. And so the whole question of culture comes up again; the whole question of fertilizing the soil; the whole question of properly pruning trees that may make it possible to produce a very fine quality of fruit in our orchards. The question of spraying enforces itself upon us here with renewed importance after listening to the this very able report. We must begin at the orchard and eliminate there as far as possible inferior quality. I I want to say I heartily endorse your action in this Association and in your

Dominion in taking these practical steps toward removing this great trouble of putting upon the English and foreign markets so much of poor fruit. One other point, and that is the local market. As Prof. Robertson has said here so truthfully this morning, we should grow finer fruits for our home consumption. The Keiffer pear is good to export for the reasons which Prof. Robertson has stated. The Ben Davis apple has good shipping quality, and it is liked for that purpose. But for home consumption we should aim to produce fruits that have finer eating qualities than either of those fruits which I have mentioned, and and there are any number of consumers who will purchase fine high-flavored apples and high-flavored pears if they can only receive these fruits in clean, sound, good condition for their own use. And so we have a good deal to learn in relation to the methods of handling and growing these fine fruits for home consumption. As the consumption of apples can be increased 100 per cent. in foreign markets, it is equally true that the consumption of finer-grown fruits can be increased 100 per cent. right here at home, and that that being done the solution of profitable orcharding is right here at our own doors. (Applause.)

A. H. Pettit: Do I understand Prof. Robertson to say that if his suggestions be adopted it would mean an inspector or inspectors of all apples being shipped from this country?

Prof. Robertson: I have no authority to speak for the Government in regard to appointing inspectors.

A. H. Pettit: How would we arrive at it without?

Prof. Robertson: Ask and ye shall receive, I suppose. (Laughter.)

Geo. E. Fisher: I understand that you suggest that the shipper may put up any sized fruit that he chooses, but that his package must state the minimum size of the contents?

Prof. Robertson: Yes.

Mr. Fisher: In my experience in shipping fruit I find that a great deal depends on the condition in which the fruit is picked. This is a feature of fruit handling that has been entirely overlooked down to the present stage of this discussion. I believe there is a right time to pick the fruit, and that the grower should have his eye on the fruit continually. He should pick his fruit in this particular stage, and he should cool it and ship it without delay, and where this is done I think there will be very few "slacks" and "wets" on the other side; and I believe that the practice of allowing fruit to remain on the tree until it suits the convenience of the grower to pick it, and then putting it on the ground and leaving it there until it suits the convenience of the packer to pack it. is responsible for the slacks and wets to a greater degree than any other cause.

The Secretary: I would like to call attention to the fact that we have with us some representatives of the Montreal Horticultural Society—Mr. Shepherd and Mr. Dunlop, and also the President of that Society. I think they should feel free to address the meeting or to speak to the subject before us. (Applause).

The President: We will be very pleased to hear from any of these gentlemen.

Mr. R. W. Shepherd, of Montreal: I am really quite unprepared to say very much, but this question of packing and grading of fruit is most interesting. Now it appears to me that the system of packing in Ontario is wrong as compared with the system in Nova Scotia. As I understand it, in the majority of cases in Nova Scotia the growers are the shippers. Of course if the grower is the shipper he will see that he will he gets No. 1 apples in the No. 1 barrels, and he will ship accordingly; and No. 2 apples will be branded No. 2? In Ontario, as I understand it, the general practice is for the grower to sell to some packer who is in the habit of buying the entire orchard and packing them to suit his own convenience. Well, it seems to me that that is the beginning of the mistake. If the grower could be educated to pack up No. 1 apples and sell them to the buyers

who will export, then I think you will get No. 1 apples shipped to the other side. Otherwise, if you are going to leave it to speculators, you will never get over this difficulty. In the Province of Quebec, of course, we do not have such large areas of apples grown, and the orchardist in the Province of Quebec, as a rule—men like Mr. Newman our President, and others—pack up their own apples and ship them, and they know what they are doing, and as a rule I think they find it is very profitable—more profitable in the long run than the system that is adopted in Ontario. Our principal apple is the Fameuse, or the Snow apple, the McIntosh Red and the Wealthy and Duchess.. These are our leading commercial apples. The Duchess we find difficult to sell, but we in the Montreal district have been shipping the Duchess to Liverpool and Glasgow, picking them before they are ripe and selling them as cooking apples. We find that they fetch better prices that way than selling on the Montreal market to compete at that particular season with the California fruits. No. 1 Fameuse, packed in a proper way, will bring a No. 1 price, and we have no difficulty in selling No. 1 Fameuse. It is the most profitable apple we grow; and in the same way with Wealthy and McIntosh Red or any red apples. My experience is that red apples are the apples to grow for the English market, and if we put them over there in good condition we are sure to get a good price. (Applause.)

Mr. Newman, (President of the Montreal Horticultural Society) said: I have been very much interested in this discussion over the packing, and I think such steps should be taken as Prof. Robertson has suggested outside, so that it would be advertised throughout the country, and a man has a guage to work by when he is packing a barrel. I have had some experience with the storage of apples, and I think your losses this year have arisen very much in the same way as losses that have occurred to me. I have stored these very sensitive fall apples in cold storage in Montreal, different cold storages there, and outside of thè temperature I have become convinced that the condition of the atmosphere is quite as important as the low temperature. I have had apples decay quite as rapidly as the cold storage, or almost as rapidly, on account of the dampness, as in a much higher temperature with a dry atmosphere. The apples being picked and often left in the orchard several days at a warm time, perhaps the air holding moisture at the time of picking, there is a ripening going on which develops more moisture, and even if those barrels are put in cold storage there is so much moisture in the barrel that they are in a very damp condition, and unless the air is very highly absorbent of moisture there will be so much moisture on the skin of the apple that rotting will take place very quickly. Now, the storages at present in Montreal are none of them, I think, of a dry nature. There is the pipe system, and granting that you would have the same air with the pipes—the pipes would absorb perhaps the contents in ice of the moisture in the air—but the doors being open so much, the air being changed continually, practically the chambers there are saturated; water is on the floor in a great many, and there is no drying power at all. I noticed this especially with my fruit last season, and whereas I have kept them in a chamber that happened to be dry other years until May, last season in the latter part of January we had to take them out on account of ripeness. There is another system started now called the dry air system, or the cold air system, and although that is rather surer to be dry I do not think it has any absorbing power. So if you were to ship from here a barrel that had been packed say the week before it got there, and the apples had considerable moisture on the skin, I do not think the apples would dry. The air is dry itself. It is chilled to about ten degrees lower temperature, than the room. It rises that much, but in the chilling chamber I think it is fully saturated with moisture. It has just the drying power that the ten degrees of rise would give it, and I see going on there now re-packing of Greenings and Northern Spys and shipping to England. A great many of the Northern Spys are about half gone, and the

Greenings are a considerable loss, and I do not see how they will be any credit even when re-packed, going over; a great many of them, when you take them up, will quite damp and greasy on the outside, and they have been there a considerable time. I should think if the skin was dry they would be in a very much better condition, although I dare say the damage was done before they reached the storage.

Mr. DUNLOP: I appreciate very much the address of Prof. Robertson. I would revert to only two points. I think the discussion has tended to show that a great deal of trouble has arisen from negligence in packing the fruit. But I think the chief point raised was that we grow altogether too much bad fruit; and if we can improve the fruit by higher feeding of our orchard, by proper pruning in trees, and by proper thinning of our fruit, this thing will gradually cease and we will have a greater proportion of good fruit and as a consequence take care in shipping it.

Mr. CASTON: How many tiers deep do they pile these barrels in vessels?

Prof. ROBERTSON: It depends on the ships. Very few ships can take more than four tiers, or about seven feet. A few ships have what they call bunk holes. and in these they pile deeper. In other ships they carry them in what they call the oar loft, about 7½ feet deep. In reference to forming standards, after thinking the thing over a good deal my own preference would be this: for a standard specifying the sizes, not for the variety, but just 2, 2¼ and 2½ inches, and then allow 10 per cent only of the contents to be under that size; and then No. 1 would indicate the good quality, No 2, No. 3, and then for anything special say Extra No. 1. I mean we must use terms that are easily understood in commerce. Then if you have size 2½ inches, No. 1 Northern Spys, or size 2 inches A No. 1 Snows, you get three things all indicated in the very simplest terms, because if you say "A No. 1 Snows" which indicate one size, and "A No. 1 Kings" which indicate another size, you would get confusion. Let us stick to the size in inches; that is easily got at, and then to the quality, No. 1 or No. 2, and then A No. 1 for extra good. Now let us take action, and see if something further is not done, because when I go back to Ottawa I am busy with cold storage, and the Minister is busy with other matters, and then another year goes by and there is no progress.

Messrs. G. E. Fisher, A. H. Pettit, W. H. Bunting, G. C. Caston, T. H. P. Carpenter, M. Pettit, and E. D. Smith were appointed a committee to deal with the matter.

The SECRETARY read the following resolution, which was carried amid applause.: "That this Fruit Growers Association hereby tenders to Mr. Geo. T. Powell, of Ghent, N.Y., their high appreciation of his very able and admirable addresses and kindly assistance during the present sessions of the Association."

The PRESIDENT: I have great pleasure, Mr. Powell, in tendering you the very hearty thanks of this Association for the excellent service you have rendered us. I am sure we have been very much instructed from your addresses. We hope at some future time to have the pleasure of having you with us again.

Prof. ROBERTSON: If that resolution had not been put quite so promptly I wanted to say just one word. Many years ago, when the Farmers' Institute system of Ontario was quite young, full of promise, but with very little history of a good kind behind it, some of us had the good chance of going to New York State and seeing what excellent work was done by the Farmers' Institutes of that State. Now, Mr. Powell was one of the fore most men in New York State in giving the Farmers' Institutes in that State the most practical and useful turn, and we in Ontario have since those days reaped a great deal of information and inspiration and enthusiasm through our Farmers' Institutes, the beginnings of which, in some parts at least, were in the State of New York under the care of Mr. Powell, who is here to-day. (Applause)

Mr. POWELL: It has certainly given me great pleasure to meet with you at this time, because I recognize that we have a common interest, that the prosperity which may come to you from all this line of educational work, through your Association, through your Farmers' Institutes, through your Department of Agriculture—whatever good comes to you is not confined to you, but extends beyond your borders and to us also. And so it is always a pleasure to meet bodies of men who are working earnestly to improve the conditions that are surrounding them; and it has certainly given me very great pleasure to be able to meet with you at this time, to take in your deliberations; and I want to say that if I have given you anything that has been helpful to you, that I have gained more myself in the short time that it has been my privilege to spend with you. (Applause).

REPORT ON SAN JOSE SCALE.

By MURRAY PETTIT, WINONA.

In February, 1898, a commissioner was appointed with instructions to make an examination of all fruit trees which had been planted five years and less in the counties of Halton, Wentworth, Welland, Lincoln, Lambton, Essex, Kent and Elgin, and to spend no time on trees planted in 1898, as these had been previously examined in the nursery. It was subsequently learned that the scale had been in the country at least seven years at that time. It was also found that the scale had been widely distributed in Ontario on nursery stock planted in the spring of 1898. No one can be blamed for these mistakes, as they were acting under the best information available at the time.

When it was found that the scale had been distributed on the nursery stock planted in the spring of 1898, Mr. Fisher was instructed to get a list of the sales from the infected nurseries and follow these trees to the limits of Ontario and examine them where they had been planted, which included nearly every county in the Province of Ontario. They succeeded in locating the scale in 100 places and destroying the trees. These 100 places were re-examined last spring, when the scale was found in only 13 of them, and again this fall when the scale was only found in 10. These have all been destroyed except in four, where the owners so far have declined to take them out. Now, when you consider 100 places being infested by the nursery stock sent out in one season, how important it is that all nursery stock should be thoroughly inspected and fumigated.

Mr. Fisher was then instructed to make careful examination of the nurseries and have the work completed before digging commenced. Last spring the work was started on the 12th of January with 20 men, and on the 20th of March 104 nurseries had been examined. The scale was found in five of them and has since been located in two more. The next order was to examine those orchards in which the scale had been found in 1898 and those to which it might have spread, locate all infested trees and have them destroyed before breeding commenced. These trees were located. While this work was being done the minister was waited upon by deputations of fruit-growers from Niagara and Essex protesting against the carrying out of the provisions of the Act. In some instances the fruit-growers' themselves made attempts to prevent the inspectors from carrying on the work. The minister was obliged by the force of public opinion to desist, and suggest a commission. Compulsory destruction of infested trees were discontinued and the scale has multiplied and spread so rapidly that now the conditions are entirely changed from what they were a year ago. It is a most important question for this association and the fruit-growers of this province to consider what should be done.

I beg leave to move the following resolution:

"The fruit-growers of Ontario desire to express their great satisfaction with the efforts made by the Ontario Department of Agriculture to destroy that most serious enemy of the fruit-grower, the San Jose scale. They regret exceedingly that any suspension of the working of the Act should have taken place, thus allowing the pest to spread with great rapidity.

"In view of the uncertain results of the work of experiment stations in the United States in the treatment of orchard trees with whale oil soap for the destruction of the scale, we recommend,

"That there be no relaxation of the inspection of orchards or of the destruction of infested trees, but that the work proceed with all vigor, while it is possible to prevent the spread of the pest.

"That in case of valuable orchard trees only slightly infested, the owner have the choice of having his trees destroyed, with compensation, or of having them treated for a certain length of time for the destruction of the insect.

"That the owner of an infested orchard, who wishes to have exposed trees treated instead of destroyed be required to thoroughly prune the orchard trees exposed in such a manner as may be required by the inspector, as a preparation for the spraying.

"That all nursery stock be thoroughly fumigated with cyanide of potassium gas under the eye of an inspector before it is allowed to be sent out."

Mr. HAROLD JONES: I have listened with interest to Mr. Pettit's report, and as representative from the eastern end of the Province I take pleasure in seconding the motion.

The SECRETARY: I think that the only question that would require any discussion at all would be whether any larger or greater freedom be allowed to individual orchardists to treat their trees than is allowed in this resolution. The only case that the resolution permits for the owner to treat his trees is where the trees are not plainly infested, but only supposed to be infested with the San Jose scale. Now, I am inclined to think that there might be a little greater liberty allowed, so that where any orchardist was willing to undertake to treat his trees under the inspector's directions, he might do so and not forfeit anything thereby. There is no danger of scale spreading from the tree while it is being properly treated, so there would be no harm to anybody but himself if the grower was successful in the treatment, and it would not prevent those trees being destroyed later if the treatment was unsuccessful. I believe it would meet the wishes of a large number of growers who are fighting vigorously against the Act if the option were allowed them of having them treated under the inspector, even if they have to go to a portion of the expense of having them so treated. That is the only portion of that resolution, it appears to me, might be modified to a certain extent. I believe otherwise that that resolution ought to have the hearty endorsation of this Association in order that the Provincial Minister of Agriculture might feel free to act in accordance with the wishes of this Association.

Mr. ROBERT THOMPSON (St. Catharines): I understand that the resolution makes no provision for the owner if he has a valuable orchard slightly infested and wishes to save that orchard, if it were possible to go on and do that under proper supervision.

The PRESIDENT: No, no provision for that. That is what is suggested to make that provision.

Mr. THOMPSON: I think from our experience in the south, in Niagara District, that unless some provision of that kind be made you will have terrible opposition to the Act like what we have had in the past—possibly such opposition as would hinder the working out of the Act as it has been hindered in this past season, allowing the terrible spread of this insect pest. I think it would be wiser, especially from some of the reports that we have received from other places, from some of the States in the south, that in sections like that around Niagara town, or up in the west in Kent, where there are large areas of two or three miles that are badly infested, where it would involve a large amount of money to pay for these trees, possibly a larger amount of money than the country would be willing to grant, an arrangement should be made for treatment which, if it would not eradicate the pest, would keep it in check. From my experience I believe wherever there is a small infestation the trees should be taken out at once without a day's delay, or a minute's delay, in the summer; but where there are larg

infestations the opposition has been so strong, and there is such a large number of trees in the area, running up into the hundreds of thousands, that it should be modified a little.

The SECRETARY: My amendment would be this, to change the clause to read, "that in case of valuable orchard trees only slightly infested the owner have the choice," and that the latter clause be cut out which says, "and in case of failure, of having them destroyed without compensation." Unless the mover of the resolution would make that change I would move that it so read.

M. PETTIT: I am quite willing that the change be made if it is the wish of the meeting to do so. I would like to ask the Association how we expect the Minister to carry out what we are asking him to do in that resolution, when it was all that he could do, and he vainly tried to get a larger appropriation than he has already expended, and when what we are now asking him to do would cost ten times that amount—roughly estimated at $300,000? No; the destruction we are asking for would cost such an amount the Minister never could carry it out; and what would be of great assistance to him, in my idea, would be for every Association in every country, or, even where they have not an Association, for all the leading fruit growers, to petition their representative in the House and urge upon him the importance of this work being carried out. That would very materially assist the Minister in carrying out what we are asking him to do.

The SECRETARY: I second this resolution as amended.

The PRESIDENT: I would just like to say in reference to the township I live in, the Scale has been found in that township in some 25 places, in every case, except two, on young nursery stock just set out from one to two years old. In every case it is entirely eradicated except the two where they were fully grown trees. Now, had that been allowed to spread our township soon would have been infested from end to end. To-day there are but two orchards at all infested. What is that worth to a township largely given up to fruit growing? I think that this work ought to be carried on at any expense by the Government, and the Scale stamped out. There may be sections where perhaps it would have to be carried on to a very large extent, but I think that the matter of a few thousand dollars ought not to be considered. I believe that had those trees been left in our township, probably inside of five years every orchard would have been infested. To-day we are clear except in two orchards, and they are in a position, I think, that can be safely controlled.

The resolution as amended was then put and carried.

Messrs. M. Pettit, the President, Robert Thompson, G. E. Fisher, Joseph Tweedle, E. Morris and E. D. Smith were appointed a committee farther to consult with the Minister of Agriculture in regard to this matter, and fully explain the wishes of this Association to the Department.

GEO. E. FISHER (Burlington): I would like to explain to the meeting two or three little matters in connection with our work for the investigation of the San Jose scale. It has been frequently stated, and no doubt you have read, that the Scale has been upon hardwood trees. There is one street in St. Catharines known as Robins street. On each side are trees, in which are planted fruit trees that are infested with the Scale. We have spent, on three or four different occasions, considerable time looking into the shade trees, which comprise hard and soft maple, and elm and horse-chestnut; and so far we have not been able to find any scale on those trees. At the north-east corner of the orchard of Mr. Aaron Cole, which is supposed to have been the original source of infestation in that section of the country, there is an elm tree. It is a tree which was probably six or seven inches in diameter, and was cut down to the surface of the ground. From the stump has grown up a second growth of elm, probably ten feet high at the present time and there were two Inspectors who spent considerable time on this tree, supposing we would be sure to find the Scale there, because a short distance from this elm was

a badly infested tree taken out; but we failed to find any Scale on that tree. Within ten paces of where the infested tree had been destroyed, we found a little elm which we examined very carefully, but found nothing. In the yard of Mr. Hutchinson, who lost upwards of a thousand trees from Scale, the trees were just alive with them. On the opposite side of the road is Mr. Stewart's place, which was badly infested, and just a little further to the south there is the Wilmot orchard in which there were some six or eight hundred peach trees which were very badly infested; and those were in the direct line of the prevailing wind, south-west from Mr. Hutchinson's door-yard, and we thought we should find some trace of the Scale in the shade trees, but we did not. Then on the other side of the road, a little farther to the north, there are about ten or fifteen acres of slashing in which there are all kinds of young growth, and we have spent a great deal of time in that slashing looking for Scale, without finding it. My information is that wherever the Scale has been seen on the elm tree it has been under very peculiar and extraordinary circumstances; but the scale is not likely to infest the forest trees—that it does not thrive on those trees where it is found. It has also been said that the men who were going about the country looking for Scale can't tell the San Jose scale from other species of scale. I say they can. Professor Howard, the chief entomologist of the United States, has made the statement that as a matter of fact a person with a little experience can determine the San Jose scale from the other species with a hand lens. That was our experience. Now then, it is also said that the Scale has been in the country a great many years, some say forty years. It might be worth while for me to state what is accepted as the only authentic history of the introduction and discovery of the San Jose scale. It was in the spring of 1887. Stark Bros., of Missouri, are a nursery firm doing a large business at a small town named Louisiana in that State. A nursery firm in California were propagating a plum that they called the Kelsey, and which they advertised as being curculio-proof. The Missouri firm made a purchase of these trees, and when the consignment came they proved to be so inferior on being examined that the Missouri firm rejected them, and wired the California firm as to what they were to do with them. The answer came that they were to send them on to New Jersey. They went into the hands of those two nurserymen with whom the scale was subsequently found. Now, this is the history of the introduction. In the meantime, Dr. Hodges, of Charlotteville, Virginia, had planted a pear orchard. In August, 1893, he found on some pears on those trees something which he supposed to be a fungus, and he sent two pears to the entomologist at Washington to have it made known to him what the trouble was. When they saw the pears they at once recognized the Scale, and sent a man back to Virginia to inspect the orchard. This Inspector returned to Washington in a short time and reported that he had found the whole place infested, and that the trees had been got from a nursery in New Jersey. Well, he was sent on to New Jersey to examine this nursery, and from the one nursery he went to the other and he found the Scale generally distributed in both these nurseries; and he also found that during those six years these nursery firms had been distributing the infested nursery trees all through the United States and into Canada; and this is accepted as the history of the introduction and distribution and discovery of the San Jose scale in the east.

EXPERIMENTAL SPRAYING IN 1899.

By W. M. Orr, Fruitland.

I am pleased to be able to report that the experimental spraying of fruit trees which has been conducted by the Department of Agriculture for Ontario

during the past five years, has again been productive of satisfactory results. —results which justify its existence. As in former years, the work was done regularly at 30 points scattered over the Province. It was intended to reduce the number of stations, but requests were so urgent that it was impossible. In addition to this an extra man had to be sent a couple of trips to a point which could not be included in the regular routes. Three agents were constantly on the road from April 25th to late in July, each point being visited six or seven times.

The attendance was largely in excess of any previous year, and enquiry for bulletins and information by mail was unprecedented.

Over 30 applications for the work in different localities had to be refused, and since the beginning of the season 15 other applications have been received.

Of course attendance is the standard by which we must estimate the interest taken in the work.

In 1896 only three stations could show a total attendance during the season of 100. In 1897, 7 stations came up to that mark. In 1898, 20 of the stations reported the attendance in three figures, and in 1899 no less than 27 out of the 30 stations made the century, the highest attendance at any one point being 281, at Southampton. The total attendance was 4718, being 1180 more than any previous year.

The mixture used was the old formula:

Copper Sulphate	4 lbs.
Fresh Lime	4 lbs.
Water	40 gals.

From 4 to 7 ozs. Paris Green was used with the above mixture according to the insects to be destroyed. As near as possible the following directions from the 1899 bulletins were followed:

First spraying: Bordeaux mixture and Paris Green when the buds are swelling.

Second spraying: Bordeaux mixture and Paris Green before the blossoms open.

Third spraying: Bordeaux mixture and Paris Green when the blossoms have fallen.

Fourth and fifth spraying: Bordeaux mixture and Paris Green at intervals of ten to fifteen days if necessary.

Systematic spraying is being taken up all over the country in the wake of the experimental work.

The manufacturers of spraying outfits have been unable to keep up with their orders even by working overtime. One of the largest manufacturers writes me: "In 1897 it was in 10's, in 1898 it was in 100's, but this year it was in 1000's."

The buyers appreciate more than ever the advantages to be derived from handling sprayed fruit, and I do not know of a single buyer who is not now an advocate of spraying. Some years ago the claim was made that sprayed fruit was larger, cleaner, better colored, better flavored, and that it possessed better shipping and keeping qualities than unsprayed fruit. This was a sweeping claim certainly, but one which has been fully proven by the records of the experimental work.

One gentleman told me that he had in one shipment to the old country this fall both sprayed and unsprayed apples. The sprayed arrived in splendid condition and brought satisfactory prices, only one barrel being slack. The unsprayed fruit was reported slack, wet and wasty, and did not pay the freight. This was especially gratifying as he was not inclined previously to favor spraying

One of the largest growers and most extensive shippers in Ontario, who

until this season, would have nothing to do with spraying, told me recently that he had made up his mind that he would have to adopt spraying or give up growing.

This year's experience confirms my belief in the statement made at our meeting last year that the Codling Moth can be controlled by spraying throughout the greater part of Ontario, but in some sheltered localities such as the Niagara Valley bandaging will have to be used in addition.

To obtain some data on this subject I carefully watched a number of bandaged apple trees during the past season. The trees were sprayed.

Trees were bandaged June 1st and examined June 15th, but no larvæ was found.

July 1st a few larvæ and several pupæ were found.

July 15th as high as 128 found on single tree, rather more than half pupae.

July 29th as high as 161 on single tree, about half pupæ, also a moth just hatched under the band.

Aug. 12th as high as 119 found on a single tree, about one-sixth of which were pupæ.

Aug. 28th as high as 142 larvæ on single tree.

Sept. 15th	„	155	„	„
Oct. 1st	„	30	„	„
Nov. 4th	„	123	„	„

From a single Baldwin tree loaded with fruit we trapped in bandages 761 specimens, from July 1st to November 4th.

The bandages were examined every two weeks, which appeared to be frequent enough. Pupæ were found up to August 12th. If these require two weeks before the moth escapes, and the moth occupies from one to two weeks in depositing her egg, and another week is required to hatch the egg, we shall have larvæ attacking our apples up to the middle or third week of September. This, I am sorry to say, is about our experience in that locality.

An exhibit of sprayed and unsprayed apples was made at the Industrial Exhibition, Toronto. The owners of the orchards where the experimental work was done were invited to select and ship samples of sprayed and unsprayed fruit of the same varieties, which would fairly represent results of the work. The exhibit when placed formed a striking object lesson as to the value of spraying.

Some were incredulous and believed that the selections were not fairly made. Allow me to read you an extract or two from letters I received. Mr. H. McCormick, Paris, writes:—"You will think some of the unsprayed ones are very uneven in size, but I could not help it."

Mr. Jos. Sandy, Omemee, writes:—"More contrast in appearance of the trees than in the quality of fruit."

Joseph Ranton. Palmerston, says:—"I was afraid to send an honest exhibit for fear the people would not believe it possible to secure such results."

Probably the most striking contrast, and the one most criticized, was in the exhibit of Mr. J. Dance, Wiarton; but an inspection of the orchard fully justified his selection.

Record of Spraying.

Joseph Ranton's Orchard, Palmerston.

Spy.—Sprayed, 96 p.c. clean; unsprayed, 12 p.c. clean.

Snow.—Sprayed, 83 p.c. clean, heavy crop; unsprayed, 4 p.c. clean, light crop.

Ben Davis.—Unsprayed, 52 p.c. clean.

Astrachan.—Sprayed, 75 p.c. clean; unsprayed, 30 p.c. clean.

Cayuga Red Streak.—Sprayed, 92 p.c. clean; unsprayed, 48 p.c. clean.

Colvert.—Sprayed, 88 p.c. clean; unsprayed, 44 p.c. clean.

Russet.—Sprayed, 72 p.c. clean; unsprayed, 76 p.c. clean.

Mr. Ranton writes :—" Concerning the experimental spraying which was carried on in my orchard this summer, I would say the benefit derived from spraying is almost incredible. Last year I had not enough sound fruit for our own use, and this year, owing to the effects of spraying, we have enough for home use and sold 40 barrels besides. I have 100 trees in my orchard, and there were only 15 sprayed, and two-thirds of the fruit was on the sprayed trees. The foliage of the trees showed green and healthy looking beside those not sprayed. As an evidence of my relying on spraying I bought an outfit and every tree in my orchard will get the benefit next year."

This orchard is 30 or 40 years old, stands in a new sod, and is in fairly good condition. Mr. Ranton says he never sold over $10.00 of fruit from it in a year before. The crop last year was heavier than this, but there was scarcely any good fruit.

J. McNab's Orchard, Southampton.

Baldwin.—Sprayed, 80 p.c. clean; unsprayed, 52 p.c. clean.

Spy.—Sprayed, 80 p.c. clean; unsprayed, no clean fruit.

Greening.—Sprayed, 87 p.c. clean; unsprayed, no clean fruit.

Colvert and Baldwins, unsprayed, heavily loaded, no clean fruit.

This orchard is in sod and fairly well cared for.

There are 80 trees in this orchard, but Mr. McNab has never sold any for packing, and never more than $10.00 worth in any one year previous to this year.

Mr. McNab writes as follows :—" The summer of 1899 was the first season my orchard was sprayed. The results were very marked. I would strongly recommend to all parties having orchards the benefits derived from spraying, the apples being much cleaner and finer in appearance, and the foliage remained green longer than previous years.

" I may also state that for the first time in my experience I sold my apple crop to buyers from a distance, thanks to spraying. Next year I hope to continue the spraying, and anticipate good results."

Mr. D. Gillander's Orchard, Wellington.

Talman's Sweet.—Sprayed, 96 p.c. clean: unsprayed, 76 p.c. clean.

Spy.—Sprayed, 92 p.c. clean; unsprayed, 12 p.c. clean.

Holland Pippin.—Sprayed, 90 p.c. clean; unsprayed, 15 p.c. clean.

Baldwin.—Sprayed, 100 p.c. clean; no unsprayed trees.

Russet.—Sprayed, 100 p.c. clean; unsprayed, 72 p.c. clean.

The packer who bought these apples said they were the cleanest he had found for years.

G. Lambert's Orchard, Thornbury.

King's.—Sprayed, 89 p.c. clean. This tree is 23 years old, and gives its first clean fruit this year.

Canada Red.—Sprayed, 93 p.c. clean, heavy load; unsprayed, 20 p.c. clean; most of the fruit dropped off.

Snow.—Sprayed, 84 p.c. clean; unsprayed, 4 p.c. clean.

Greening.—Sprayed, 92 p.c. clean; unsprayed, 4 p.c. clean.

Astrachan.—Sprayed, 90 p.c. clean; unsprayed, 50 p.c. clean.

Cayuga Red Streak.—Sprayed, 88 p.c. clean; unspraped, 57 p.c. clean.

Spy.—Sprayed, 96 p.c. clean; unsprayed, 18 p.c. clean.

Alexander.—Sprayed, 85 p.c.; always scabbed before.

Irish Peach.—Sprayed, 75 p.c.; never fit for use before.

On November 23rd Mr. Lambert writes :—" With great pleasure I write the results of the Government spraying in my orchard this season. In the spring when the agent came upon the scene my orchard was infested with all kinds of insects, especially the forest tent caterpillar. At the first application the pest

was checked, and the general tone of the orchard was good, foliage good, and fruit mostly set well. In gathering and packing every variety sprayed showed a marked advantage, scarcely any scale and much less codling moth than on the unsprayed trees. In all the varieties sprayed I would say there was an average of 80 p.c. to 90 p.c. of clean fruit. I feel convinced that spraying properly doné will pay better than any work on the farm."

The annual yield of apples in Ontario varies from 4,000,000 to 18,000,000 barrels per year. Estimating the average at 8,000,000 barrels. This can be increased easily by a third, and a much better class of fruit exported which would command an extra high price in the foreign markets. This is not supposition, but a conservative estimate, which is justified by the results obtained from a number of years thorough work in the experimental spraying.

Mr. Pattison, (Grimsby) : I would like for your information to criticize this spraying a little, and ask a few questions as to a thing that has puzzled me this season. I may say that I have personally sprayed with Paris green for a great number of years with fairly good results. This year for the first time I sprayed with copper sulphate and the Bordeaux mixture, and very carefully. My experience goes to show that in our district, while a very excellent application for the foliage, and also for the fungus spot, that the mixture of the Bordeaux mixture and the Paris green totally kills the Paris green. And in order to show you that I am not saying this without some reason, I left some of my trees and sprayed them only with the Paris green. A neighbor of mine, who has a nice plum orchard, told me that the curculio was working badly in his plums. He said he had never sprayed, and I let him have my old pump and he sprayed his plum crop very carefully with Paris green without any copper sulphate. He had a full and excellent crop of plums. I sprayed my orchard rather more often than he did, but I used the copper sulphate with the Paris green, according to the formula, on my plum trees. The result was that the curculio fattened on that application and actually screamed for more (laughter) ; and I lost two-thirds of my crop. It had apparently no effect whatever on the curculio. On the apple trees that were only sprayed with Paris green without the sulphate the proportion of clean fruit was about two-thirds, and on those sprayed with copper sulphate there was hardly any fruit to be found. Of course last season was a dry one, and the spot did not work to any great extent. Now, my explanation of this is that the lime kills the Paris green. Of course lime is absolutely necessary to prevent the sulphate of copper from injuring the foliage, but my experience is that the lime totally kills the effect of the Paris green. I have been enquiring into the subject since then, and find that several others have the same experience, I should like an explanation of this, because it cost me between $400 and $500 to find this out, if I have found it out.

Mr. Thompson : It is a common practice with us to mix Paris green with either land plaster or lime on potatoes, and we find it is a dead shot every time.

Mr. Huggard : I found in spraying with Paris green and lime for potatoes there were no beetles left when it got dry, but where we simply mixed the Paris green with water I sprayed three times and it did not kill them all.

Mr. Pettit : Mr. Pattison's Paris green has been badly adulterated.

Mr. Pattison : How do you account for the fact that those trees that were sprayed with the Paris green without the sulphate worked all right ? I am not asserting anything ; I only suggest that as a reason. I cannot see any other. If anybody can I will be very glad to know it.

The President : The survival of the curculio would indicate to me that the Paris green must have been adulterated, and it was just strong enough to make them sick and not strong enough to kill them. I have been spraying my own plum orchard with Paris green in this way for the last ten years, and it has been entirely satisfactory, and that has been the almost universal report.

Prof. SAUNDERS: I do not see how it is possible that the mixture of Paris green and lime would destroy the action of the poisonous principles in the Paris green. The Paris green is an arsenic of copper which is quite insoluble, and if lime was mixed with it I cannot see chemically how it would alter its nature so as to lessen its poisonous action. We know that London purple, which is a compound of Paris green and lime, has been used in many localities, and I never heard of its having lost any of its poisonous properties by having been associated with the lime. We know that Paris green is largely adulterated, and it may be that Mr. Pattison has got hold of a sample that was not up to the mark in strength; but I think it would be very unwise to allow any impression to go out from this Association that Paris green, when associated with lime in the Bordeaux mixture, is lessened thereby of its poisonous effect. The sulphate of copper when mixed with lime forms a mixture of oxide and carbonate of copper in suspension, and a good deal of the strength of the lime is utilized in making that change in the copper salt, so that it is not at all in as strong a caustic condition as it would be either in its association with arsenious acid in the London purple or in the case of an acid where the Paris green was associated with freshly slacked lime.

The PRESIDENT: In spraying plum trees with Paris green without lime you have to be very careful indeed, or you will seriously damage your foliage.

Mr. PATTISON: I have done it for years without any serious damage, until this year.

The PRESIDENT: What proportion did you use without the copper sulphate?

Mr. PATTISON: Two and a-half ounces to forty gallons of water.

SOME RESULTS OF EXPERIMENTS IN SPRAYING AT THE CENTRAL EXPERIMENTAL FARM IN 1899.

BY PROF. W. T. MACOUN, CENTRAL EXPERIMENTAL FARM, OTTAWA.

During the past ten years spraying has been one of the prominent features of the work of the Horticultural Division at the Central Experimental Farm. In 1890 the late Horticulturist, Mr. John Craig, began experiments in spraying, and ever since that time this work has been carried on with vigor, and no opportunity has been lost in impressing upon the fruit growers of Canada the great importance of it. In 1890 the use of the Bordeaux mixture was confined to a small number of the most progressive fruit growers and experimenters, while to-day it is a well recognized fact that if a man does not spray he will not, as a rule, have first-class fruit. The reports of the Experimental Farms containing the results of experiments in spraying, and the Spraying Calendars which have been issued during the past ten years, must have been of great service to the fruit growers of Canada, judging by the many letters which have been received testifying as to the value of the information given and the good results obtained by following the instructions in the reports.

It has been my endeavor during the past two years to give as much attention to experiments in spraying as time would permit, and also to adopt the best practices in the spraying of the fruit trees in the orchards at the Experimental Farm.

During the past year the experiments conducted have been of a very interesting nature, and it is hoped that the results will be of some service to our fruit growers.

Many of you have probably read Bulletin No. 38 of the Missouri Agricultural Experiment Station, in which are related certain experiments which were conducted by Prof. S. C. Whitten, the Horticulturist, the objects of which were to

prevent the winter-killing of the flower buds of the peach. Let me give his summary of results, which will give those of you who have not read this Bulletin an idea of what was done.

"I. In this latitude, winter killing of the fruit buds of the peach is usually due to the unfavorable effects of freezing after they have been stimulated into growth by warm weather, during winter or early spring.

"II. The early swelling and growth of the buds is due to the warmth they receive, is practically independent of root action, and may take place on warm sunny days in winter, when the roots are frozen and dormant.

"III. Peach fruit buds may safely endure a temperature of ten or twenty degrees below zero, provided they mature well in autumn, are entirely dormant, and the cold comes on gradually.

"IV. Zero weather may kill fruit buds that have swollen during previous warm weather, or that were not properly ripened in the autumn.

"V. Shading or whitening peach trees to prevent their absorbing heat on sunny days, opposes growth of the buds and is, consequently, a protective measure.

"VI. Shading the trees with board sheds enable peach buds to survive the winter uninjured, when eighty per cent of unprotected buds were killed.

"Trees protected in this way blossomed later, remained in bloom longer, set more fruit in proportion to the number of apparently perfect flowers, and held their fruit better than any other trees on the Station grounds. This is the most effective means of winter protection tried at the Station, but it is probably too expensive for commercial orchards.

"VII. Whitening the twigs and buds by spraying them with whitewash is, on account of its cheapness and beneficial effects, the most promising method of winter protection tried at this Station.

"VIII. Whitened buds remained practically dormant until April, when unprotected buds swelled perceptibly during warm days late in February and early in March.

"Whitened buds blossomed three to six days later than unprotected buds.

"Eighty per cent of whitened buds passed the winter safely, when only twenty per cent of unwhitened buds passed the winter unharmed.

"IX. Thermometers covered with purple material registered, during bright sunny weather, from ten to over twenty degrees higher than thermometers covered with white material of similar texture, thus indicating that whitened peach twigs might be expected to absorb much less heat than those which were not whitened."

As the question of the winter killing of the fruit buds of the peach is a matter which interests many of our own fruit growers, I desired to be in a position to state whether the results obtained by Prof. Whitton could be repeated here or not. But not having any peach trees at Ottawa on which to try the experiment the test was confined to plums, cherries, and apples.

The number of trees used were: Plums, 5; cherries, 3; apples, 6.

Whitewash was made by using unslaked lime, skim-milk, and water in the proportion of:

Skim-milk	6 gallons
Water	24 "
Lime	60 pounds

The lime was slaked in warm water and the remainder of the liquid added. It was then strained through a one-twelfth inch mesh, and was ready for use. As the experiment was not on a very large scale, a hand pump, the Spramoter Jr., was used with a Bordeaux nozzle, which worked very satisfactorily. The first spraying was given on 16th February, and successive spraying were made on 21st and 25th February, 1st, 10th, 13th March, and 1st April, six in all, the object

being to keep the trees pure white from top to bottom until warm weather came in the spring.

The following notes were taken at intervals from the latter part of the winter until warm weather:—

Plums.—April 5th: No apparent swelling of the buds on either sprayed or unsprayed trees.

April 15th: No apparent swelling of the buds on either sprayed or unsprayed trees.

April 20th: Buds on unsprayed trees very slightly swollen; buds on sprayed trees still apparently dormant.

April 24th: Buds on unsprayed trees of Americana class slightly swollen; on sprayed trees, just perceptibly. Buds still apparently dormant on sprayed and unsprayed trees of Domestica class.

April 29th: Flower buds on American plumbs now showing quite generally on unsprayed trees, a few flower buds showing on sprayed trees, but difference very decidedly marked, not so much swollen. Buds on unsprayed European plums just starting perceptibly. On sprayed trees still apparently dormant.

May 2nd: Flower buds now exposed on both sprayed and unsprayed trees, but difference more marked than before. Greater contrast in buds on unsprayed and sprayed trees of European plums. Buds on sprayed trees have only swollen slightly.

Temperature was above 80° F. on 30th April, and 1st May and 2nd May, causing rapid swelling of buds. It would be impossible now to keep buds covered with lime unless sprayed every day.

The dates of blooming of the plums sprayed and unsprayed were:

Jessie (American), unsprayed	22nd May.
" " sprayed	24th May.
Early Red (European), unsprayed	13th May.
" " sprayed	22nd May.

A considerable number of blossoms on the Jessie plum were killed by the whitewash, but the plums on the sprayed trees were larger than on the unsprayed, and there was the same quantity of fruit on it as on the unsprayed tree The two trees were about the same size.

There were only a few blossoms on both sprayed and unsprayed trees of the Early Red plum. There were about the same number of blossoms on both trees.

A tree of a hybrid between the Sand Cherry and the American plum in the Director's garden was sprayed with the whitewash and a considerable number of buds were killed by the wash.

Cherries.—April 5th: Buds on unsprayed trees swollen very slightly; on sprayed trees, still apparently dormant.

April 15th: Buds on unsprayed trees swollen slightly; on sprayed trees still apparently dormant.

April 20th: Buds more swollen on unsprayed trees; on sprayed trees, just starting to swell. A tree, part of which was sprayed and part unsprayed, has buds more swollen on unsprayed than on sprayed parts.

April 24th: Difference between sprayed and unsprayed cherry buds very apparent now.

April 28th: Still greater difference between sprayed and unsprayed buds, though sprayed have swollen considerably.

May 2nd: Still a marked difference between sprayed and unsprayed.

There were no flowers on either sprayed or unsprayed trees. There was no apparent injury from the use of the whitewash on the trees.

Apples.—April 5th: Buds apparently still dormant on unsprayed and sprayed trees;

April 15th: Buds apparently dormant on sprayed and unsprayed trees.

April 20th: Buds on unsprayed trees very slightly swollen on the 20th; on unsprayed trees no perceptible swelling is noticed to-day. Buds of sprayed trees still apparently dormant.

April 28th: Buds swollen slightly on both sprayed and unsprayed trees.

May 2nd: Buds are still only slightly swollen on sprayed and unsprayed trees; no apparent difference.

The results here given are sufficient evidence of the fact that the retarding of the swelling of the buds was quite marked on trees of plums and cherries. The difference in the dates of blossoming was slight in the American variety but greater in the European. A considerable number of the blossoming buds of plums were killed by the whitewash. As the buds on apple trees do not swell until late, the whitewash appeared to have little affect in retarding the swelling of them.

I am not yet prepared to say whether it would be practical or advisable to spray peach trees to prevent winter killing of the buds, but from the apparent effects of the whitewash in ridding apple trees of the Oyster Shell Bark Louse, it is well worth further experiment to determine whether the same results could not be obtained in treating the San José scale on peach and other fruit trees, and in the case of peach trees it might serve the double purpose of retarding the swelling of the buds and killing the scale.

Notwithstanding the thorough spraying which the trees in the orchards at the Experimental Farm have received, the Oyster Shell Bark Louse, which has affected the apple trees for several years, has never been entirely destroyed there. Last spring, all the apple orchard, with the exception of the trees which had been whitewashed, received two sprayings for the purpose of, if possible, destroying this pest. Careful watch was kept for the day when the young lice made their appearance, which the first ones did on the 29th May. On 1st June the trees received a spraying of tobacco water and whale oil soap, made by using ten pounds of tobacco and two pounds of whale oil soap to forty gallons of water. Specimens of the young insects were examined under the microscope and where found to be dead within an hour of the time they were sprayed. On the 6th June the trees were sprayed a second time with whale oil soap, eight pounds to forty gallons of water. This was supposed to kill anything that was left. Although their number was much reduced, there must have been a considerable number escaped, as healthy scales were found in the orchard later in the summer.

But to return to the whitewash: It will be remembered that these trees were not sprayed in the spring when the trees were treated for the louse. What was my surprise during the summer after the whitewash had come off to find the trees practically free of the bark louse. All the old scales had disappeared, the bark of the trees was bright and clean, and had altogether a healthier appearance than those under otherwise the same conditions. Now none of these trees were examined for bark louse before they were sprayed, but considering the fact that the remaining 72 trees of Wealthy, 31 of Duchess, 26 of Tetofsky are all from slightly to badly affected with old scales.

There is, I think, ample evidence of the wonderful effect of the whitewash on this insect.

Experiments are now in progress at the Farm to determine, if possible, the best time to whitewash the trees to get the best results, the number of applications necessary, how long before the whitewash takes effect, and any other point which may come up. It is proposed to try some experiments in some orchards affected with the San José scale, to see what effect it will have on that pest. I hope to be able to communicate the results next year.

The use of lime in whitewashing the trunk and large limbs of trees is an old custom and still adopted by a few. It was supposed to be a cure-all, and I have not been able to learn just what effects it really had.

Lime was recommended by Forsyth in 1802 for the destruction of Aphis and Red Spider. His formula was:

Unslaked lime........................	½ peck.
Water	32 gallons.

It was applied by means of a syringe.

Air-slaked lime is used successfully in destroying slugs on the foliage of trees.

Lime was recommended in 1850 against the curculio of plums by Lawrence Young, Louisville, Kentucky, and it was said to have been used successfully by him. "It consists simply in covering the young fruit as soon as danger is apprehended with a coating of thin lime wash, considerably more dilute than the mixture used in whitewashing."

In Bailey's Horticultural Rule Book we find lime spray recommended to prevent the attacks of the Rose Chafer. The formula reads: "Slake one-half peck, or a peck, of lime in a barrel of water, straining the lime as it enters the barrel, to prevent its clogging the pump. Apply in a spray until the tree appears as if whitewashed."

Nowhere have I found that trees have been whitewashed for the purpose of killing scale insects.

Prof. SAUNDERS: I have much pleasure in supporting what Prof. Macoun has told you with a remark or two as to the conclusions reached by myself from very careful examination of those trees which were operated on with the whitewash. We have suffered for a long time at the Central Farm with Oyster Shell Bark Louse, and they work persistently at it every year with the hope of getting clear of it, but have not been able to get our trees entirely clean. During the past year Mr. Macoun has made a strong effort with tobacco to rid the orchard of this pestiferous scale, and I think has succeeded with a great many trees in almost entirely removing them; but I was very much surprised on examining those trees which had been sprayed with lime to see how thoroughly the work had been done, and when the lime was washed off and all the scales, old and young, were entirely removed, and I failed to find on several trees examined anything in the shape of scale left. This whitewash was not applied with the idea of removing the Oyster Shell Bark Louse, but rather to ascertain how far the whitewash would delay the opening of the buds; but the incidental result is most surprising and most gratifying to me, and I hope it will be tried in those sections of the country where the San José scale is abundant, and we shall hear something further as to whether it may not be useful in this way. The complete covering which the lime gives to the twigs is, as Mr. Macoun has very well said, easily seen, and it is so complete that it must prevent the access of air to the scale. It will also, because of its caustic nature, have a penetrating effect on the scale itself; and I am hopeful that we shall find in this lime application not only a thorough application for the Oyster Shell Bark Louse, but also a remedy which will be useful in every case of the scale.

Mr. TWEDDLE: Before we leave this subject I think we ought to have a little discussion on the Codling Moth, and I want to corroborate what the president has said on the point. I believe we ought to make the bands for the destruction of the codling moth compulsory by Act of Parliament, the same as we do with the black knot; and I think in proportion to the amount of work and expense with the bands we get great results. I have about 75 acres of apple orchard this last season with bands on every tree, and I can say that we caught any amount of moths, but we did not save the crop, and that is the trouble, because nobody else in the neighborhood used those bands but Mr. Orr and myself. I think is everybody were compelled to use those bands we could save our crop, or a large proportion of it. I do not see why we should not ask our legislature to pass an

Act on the local option plan just the same as our Black Knot Act, and have municipal councils pass a by-law to force it, on the petition of ratepayers. I should like to see this put in the hands of some of our committees. The winter through, those bands will collect as many as 200 moths to a band. If all of us would do that we would start off with a clean sheet in the spring.

E. D. SMITH: I think Mr. Tweddle is exactly on the right track. My experience has led me to believe that we cannot expect to control the codling moth with Paris green. I have sprayed with Paris green a good many years and this year made a most thorough test under your own supervision.

The PRESIDENT: Up to a given date.

Mr. SMITH: Yes; I sprayed the trees five times under your instructions; and in addition to that, not having confidence in it for the Codling Moth, but having the confidence in the spraying chiefly for the scab—I have great confidence in it for that—I determined to go back to what I had made up my mind to do ten years before the spraying came into vogue, namely, the bandage, and I put the bandages on early. My orchard has been clean for twenty years, and the trees were scraped clean, so there was no place for the Codling Moth to go but under these bandages. The bandages were put on early and inspected once a week all summer. The consequence was that when the apples were about the size of walnuts we found no Codling Moth, hardy could find a specimen in the orchard, and thought we should have perfectly clean apples. Later on, however, I found some moth under those bandages, and they were killed once a week, but not in great numbers—from five to twenty a week under each bandage would be about the average Now, there was not a Codling Moth that came in those bandages but what was killed. The spraying was done thoroughly, and up to the time the apples became the size of walnuts no Codling Moth could be found; but what was the consequence? At the end of the season we found from three-fourths to seven-eights of our apples with worms in! Now where did they come from? The only conclusion I could arrive at is that they came from the neighbor's orchard across the road who did nothing, neither sprayed nor put bandages on. Is it not discouraging, then, for a number of men to continually go to this expense, spraying aud bandaging their trees, if it is going to be of no avail because a neighbour's orchard across the way is neglected? I cannot see any remedy except that suggested by Mr. Tweddle, that under a local option, just like our Yellows and Black Knot Acts, a law be put in force in the township. It is no great expense or hardship; it is surprising how little it costs. If these bandages were put on a ten acre orchard the only cost is the labor of one man one day to take them off and examine them and kill the worms. That, conducted for five weeks, would only be a matter of $5 on a ten acre orchard, aside from the initial expense, which does not amount to very much either. These bandages would last many years. I think there is a great deal in Mr. Tweddle's suggestion. It is the only solution I can possibly see of the Codling Moth.

Mr. TWEDDLE: Some eight or ten orchardists used bands, and every man said they were the best preventive they ever saw; they all believed in them and they believed it would be a good thing to make it compulsory.

Mr. CASTON: What did you use for bandages?

Mr. TWEDDLE: Just this rough canvas. (Shown.)

The PRESIDENT: There is one that has been used a year.

Mr. TWEDDLE: We sprayed with half a pound of Bordeaux mixture to forty gallons of water and we found one in four of the Codling Moths dead. It did not prove effectual enough; but with all the bands the Codling Moths came from somewhere else. We had an orchard just like Mr. Smith's. Up till the middle of August you could not find a moth in them, but the last of the fruit so multiplied them that they spread all over. At one orchard on the lake shore we took out

43 barrels of No. 1 ; 100 bushels were effected by the moth, just about the best of the fruit.

A MEMBER : How do you use the band ?

The PRESIDENT : Roll it around the tree as a bandage and tie it with binder twine. It is just the harbor that they want. In regard to Mr. Smith's orchard, I might say that in my last year's report I said I purposed taking some orchards and carrying on the spraying with the Paris green right up to picking time to see what results we would have ; but the Department decided the work should not go on the latter part of July and August, so that put an end to that. Mr. Smith says that up to the time the apples were a little more than half grown there was not a sign of Codling Moth Up to that time he had been spraying. Now if his neighbors supplied all the Codling Moth that destroyed all the crop later they certainly would have supplied some to damage the early crop. What we should do is to continue spraying right up to the time of picking. We know that the Codling Moth is working right up till the apples are picked, because we find the young worm just hatched even after the apples are picked, which shows that the egg could not have been laid more than two weeks at most. To make a thorough test of it I am satisfied we will have to continue spraying right up to the time of picking.

A MEMBER : Would it not remain on the apple ?

The PRESIDENT : I do not think so ; not to do any harm. I never saw a case where it would have the slightest effect in that way.

Mr. JONES : A person could continue the Bordeaux mixture and not the Paris green.

The PRESIDENT : There will be no need of continuing the Bordeaux mixture, just the Paris green. While we are badly infested with Codling Moth in the southern section, in the northern section they have only one brood, and the regular experimental spraying almost controls it ; but the Oyster-shell Bark Louse, from the Ottawa River right through to the back of the Province, is exceedingly bad, probably ten times as bad as it is with us at the front I think we must have some parasite in the southern section that destroys the Oyster-shell Bark Louse, but in the northern section it seems they have not any. I saw full-grown apple trees at Shelburne killed with the Oyster-shell Bark Louse. If it can be killed by spraying with lime it will be a great boon to this country and and to apple growers. We will be very glad to know more of the experiments and results.

Mr. CASTON : I believe that the application of bands on the trees is one of the best methods that can be adopted for keeping the Codling Moth in check. I believe we have two broods in the more northern section, and they travel around a good deal seeking shelter for the winter, and also the larvae travel around seeking a place to breed. I accidentally made a little experiment in that line. I had a piece of canvas that was used for a bed of onions, and when I was through with it I accidentally placed it in a Pewaukee tree that stood there—just a young tree beginning to bear, with only half a dozen apples on it : and later on in the fall, I think in November, I saw that piece of canvas still in the tree and thought I would examine it, and found either 32 or 34 moths in that. Now, they did not all come from that tree, and it stood at a considerable distance from the other. They could not have come from that tree, because there were only three or four apples on it, and if I recollect rightly I think most of them were sound. So it shows they travel a considerable distance, and they had gone up three or four feet from the ground and made their nest in the rag, and 32 or 34 had settled there for the winter. It would be a good plan to have a bandage that could be removed rapidly, and have a kettle of boiling water and a fire in the orchard, so that the bandage could be removed and dipped into the scalding water ; we would then have in our hands one of the most effective means of dealing with this pest. It is a lamentable

thing to have to throw first-class apples among the culls because of two or three worm holes. I was very much gratified to hear about the excellent results of spraying with lime with regard to the Oyster-shell Bark Louse. If that fact alone is established it is worth probably half the cost of the Experimental Farm at Ottawa to the fruit growers of this country. (Applause.) It is going to be a grand thing, and I will tell you why. In the northern sections we have the Oyster-shell Bark Louse very bad. I find no difficulty in dealing with it on the trunks and limbs of the tree where it can be reached, because I make it a practice to go over the trees with the alkali. I use lye strong enough to float a boat, and dilute it with water, one part to six. For smaller trees I dilute it still more. I make it a practice to scrape off the bark on the bearing tree and give them a drink of that lye once in two years, and that effectually removes the Oyster shell Bark Louse and has a good healthy effect on the tree; but they spread themselves over the tree where you cannot get at them. I use an old birch broom for that, and it has a good effect as far as you can reach them, but away out on the twigs you can't get at them with anything of that kind. Now, if this spraying with lime will remove them, and we have good evidence that it will, I think that that is a very valuable fact itself to the fruit-growers of this country. In regard to the Bordeaux mixture I have used it for potatoes, for rot and for Colorado beetle, and found it was just as effective when mixed with lime as with Paris green. Some of us might like to try experiments this winter along the line of lime spraying. When should we do it?

Prof. MACOUN: My impression is the best time would be toward spring because the Scale at that time would be getting softer if the weather were at all mild. At this time of the year the Scale is probably harder than in any other part of the year, except perhaps the latter part of February. I should imagine the best time would be from the end of February until the bud starts to swell. I would not like to risk it after that, because I do not know what affect it would have.

Prof. SAUNDERS: What time was your spraying made?

Prof. MACOUN: On the 10th or 15th February. I may say my experiment at the farm is in this way: I am trying some trees with one application of lime others with two, others with three and others with four applications, because I want to find how much lime it takes to kill those insects. It may be that they are smothered, and if so it will take considerable time to do it. If it is the caustic nature of the lime two applications will be enough, because you can get a tree covered with two applications. I thought of discontinuing till about February and then starting and going on till spring again with four or five or six applications, to find out just how much lime it would take. In regard to the San Jose scale, it seems to me quite possible that if there was a thick enough coating of lime on the peach trees just when the young insects come out in the spring, they would not have anything to feed on, and it is possible they would die of starvation.

Mr. CASTON: You have not found the lime affect the tree injuriously?

Prof. MACOUN: Not the apple trees. On the Duchess we have the best crop on one tree that we sprayed, and the trees had a much healthier appearance this summer.

Mr. SPOHN: Would a brush do as well as a spray pump?

Prof. MACOUN: You could not do it on the tops of the branches.

Mr. SPOHN: Suppose they were small-sized trees?

Prof. MACOUN: I don't think they could do it fine enough with a brush. It needs to be spread as fine as possible so as to get in all the cracks.

The PRESIDENT: I would like to ask Prof. Saunders how far he thinks the Codling Moth will pass from one orchard to another?

Prof. SAUNDERS: I think it quite possible for the Codling Moth to travel many miles. It is a very active insect when on the wing. I have often watched them in flying, in the house particularly. They do not usually fly to light, in the way some other moths do, but occasionally one finds a specimen in the house, and I have been struck with the wonderful power of flight they have for so small an insect, and how long they will keep on the wing, and how active they are. So I do not think there is any doubt that they will travel a mile or two seeking suitable locations for depositing their eggs. Of course the instinct to search and find suitable locations for depositing the eggs is very strong in all the moths, and many of them will live under the most difficult circumstances for days until they have deposited their eggs, and they will exert themselves to their utmost to find a suitable place to put them.

The PRESIDENT: This tree from which we took off over 600 this year, is an isolated tree. There are orchards near by that have never been treated. and I think it must have been largely infested from those orchards. Now, if that is the case it is useless for one man to spray and bandage unless his neighbor does it, or has to do it, and I think this matter of legislation might be taken up—a committee appointed to investigate and at least look into the matter. Do you think such a thing would be feasible?

Dr. SAUNDERS: We know the Black Knot law is not very well carried out. It is not wise to have too many laws that are inoperative. If it could be made a matter of option in different counties, as has been suggested, I do not see why it should not be made of very great use. In regard to the larvæ you found under the bandages, they must all come from a reasonable distance from the tree on which you found them. I do not think it would be possible for a larvæ of that character to travel anything like a mile looking for a location on which to go into chrysalis; they would not likely travel half that distance. Probably 100 yards would be as far as they would go. They do not begin to seek a hiding place until they are fully grown, and they usually take the first good spot they find to change into chrysalis. They are active mainly at night, and they crawl about then in search of a suitable spot; and in the case reported by Mr. Caston, where there were so few apples, on the tree, no doubt these larvæ came from some other trees in the same orchard.

Mr. CASTON: Suppose we have very clean cultivation in our orchard?

Dr. SAUNDERS: That does not affect them; they can get over all the quicker if it is clean. They will not go into chrysalis on the ground as a rule. They want the crevices in the bark on the tree to make their change, and that is what they look for, and in that case they travelled from some of your other trees, dropped on the ground in the fruit, or dropped sometimes before the fruit matured, by means of a thread, and then they travel about until they find a suitable locality.

Mr. CASTON: They must come a distance of 200 trees.

Dr. SAUNDERS: Yes, they could easily travel that, or at least 200 yards.

Mr. TWEDDLE: That just makes the matter all the more necessary. The trouble is that the moth comes and lays the egg, and the egg hatches and goes through the process before you can catch it at all, and that is where the difficulty comes in. We would like other people to catch them before they get into our orchards.

E. D. SMITH! What Mr. Tweddle just says is important. It is evident in my own case from what I caught under these bandages that there were not very many, and there were apparently none in the apples; I caught them all that were off my own orchard, but the apples had eggs laid in them from somewhere else. These were flying moths. They were hunting apple trees with apples on, and, as Prof. Saunders says, they fly quite a distance. They could easily fly across the road to a neighbor's orchard and lay their eggs there. I think it is

high time we took some action in this matter. Prof. Saunders says the Black-Knot and Yellows Act has not been very successful. Well, I believe not in many places, but in our township and others where fruit growing is carried on in a large way, and the fruit growers are interested in the matter, it is carried out. All that is necessary is that twelve ratepayers go to the council, and they must appoint an inspector, and on the report of that inspector any one who has his orchard infested with this must destroy the trees. I believe if the same option were given to the township of Saltfleet we would take advantage of it and every tree in the township would be bandaged, and then we would see whether the Codling Moth would not be eradicated.

A committee was then appointed to deal with the matter, consisting of Messrs. J. Tweddle, E. D. Smith, W. M. Orr and A. H. Pettit.

NEW HARDY FRUITS FOR MANITOBA AND THE NORTH-WEST TERRITORIES.

BY DR. WM. SAUNDERS, F.R.S.C., F.L.S., DIRECTOR EXPERIMENTAL FARMS, OTTAWA.

During the past twelve years, since the Dominion Experimental Farms were established, persistent efforts have been made to find some hardy varieties of apple which would endure the climate and bear fruit in the Canadian North-West. Varieties have been brought from all the northern Countries in Europe where apples are grown and all the different sorts obtainable which have originated in the north-western parts of the United States have also been carefully tested. In this way more than 200 varieties have been tried, some in the open and others with different degrees of protection and shelter, but none have succeeded. While it is possible some seasons, where special shelter and protection are available, to grow in Manitoba the Transcendant and Yellow Siberian Crabs and a few of the hardiest sorts of Russian apples, this has only been done under very exceptional conditions and in localities where the altitude above sea level is not great. All attempts to grow these varieties in a general way under such conditions as are available to the average farmer have resulted in failure, and the conclusion has been forced on us that notwithstanding the few partial successes which have been recorded, that the growing of the hardiest sorts of apples at present available in a general way in that north-west country is quite impracticable.

Experiments were early tried with the wild crab apple of Ontario (*Pyrus coronaria*) thinking that possibly from this source some hardy and useful sorts might be obtained, and several hundred seedlings were raised at Ottawa from seed collected from wild trees in Ontario. These were sent to the experimental farms at Brandon and Indian Head and planted there under different conditions as to shelter. A few of them survived in a partly killed condition for a year or two and then died out. Experiments were also tried with seedlings of another wild crab known as the Berried Crab (*Pyrus baccata*) the seed of which was obtained from northern Siberia, and the young trees grown from this seed have proved entirely hardy at both the western experimental farms and have started each spring from the terminal buds on their branches since they were planted. They have also borne fruit, but this has been so small as to be of little value.

In the spring of 1894 this small wild crab was crossed with several varieties of hardy apples such as Tetofsky, Wealthy and Duchess, also with some of the larger crabs, including Transcendant, Orange and Hyslop. From the seeds obtained from this work of crossing, young trees were grown which when one

year old were planted in a small orchard. They have grown very rapidly and have made handsome young trees more or less pyramidal in form and branching close to the ground. During the past season thirty-six of these cross-bred sorts have fruited and some of them have borne heavy crops Among these there were five which produced fruit of such size and quality as to warrant their being named and propagated for more extended trial. The fact of their having fruited so freely on the fourth year from the sowing of the seed indicates a prolific and early bearing habit. The names and descriptions of the five selected varieties are here given in what is believed to be the order of their merit.

Charles.—A cross of Pyrus Tetofsky on *Pyrus baccata.* Tree a very upright and vigorous grower with large leathery leaves of considerable substance. The blossoms are deep pink in bud, pinkish white when open, large, with wide petals. The fruit set well and was distributed very evenly over the tree. Ripe Sept. 3rd. Size, 1 9-16 inches across, 1 6-16 inches deep, very distinctly ribbed. Colour a uniform yellow, very attractive. Flesh, yellow, solid, crisp, juicy, very mildly acid and very mildly astringent. Flavor pleasant, skin rather thin, bakes well. When compared with the Transcendant crab the size was practically the same, the acidity and astringency a little less. Stem long, calyx persistent.

Novelty.—A cross of Wealthy on *Pyrus baccata.* Tree fairly upright in habit and a vigorous grower, with good foliage. On this tree there were only a few bunches of blossom, which were deep pink in bud, white when open, flowers large, petals broad. Fruit ripe Sept. 19th. Size, $1\frac{1}{2}$ inches across, $1\frac{1}{4}$ inches deep, smooth. Colour, deep red. Flesh a pale yellowish pink, firm, crisp and juicy, sub-acid and of fair quality. Stem long, calyx unusually persistent. Bakes well, quality when cooked very fair The largest and best of the Wealty crosses which have yet fruited.

Aurora.—A cross of Tetofsky on *Pyrus baccata.* Tree a vigorous grower, upright in habit, with large thick leathery leaves. Blossomed freely. Flowers deep pink in bud, large when open, pure white, petals broad. Fruit sat freely and was ripe September 11th. Size, 1 7-16 inches across, 1 3-16 inches deep. Colour bright red almost all over, very pretty. Flesh crisp, juicy, acid and of fair flavor, astringency very slight. When baked this fruit is acid, but of good flavor. Stem long, calyx persistent.

Progress.—A cross of Wealthy on *Pyrus baccata* The tree is a vigorous grower and fairly upright in habit. It blossomed freely; the blossoms were deep pink in bud, pinkish white when open, flowers large, petals wide. Fruit ripe September 14th. Size, 1 5-16 inches across, 1 3-16 inches deep. Colour red, with some yellow and a dark red cheek. Flesh very firm, crisp, juicy, sub-acid, astringency scarcely perceptible, of fair flavor. Stem long, calyx persistent.

Prairie Gem.—A cross of Tetofsky on *Pyrus baccata.* This tree is a moderately vigorous grower and rather spreading in habit. It was heavily laden with fruit from top to bottom. The tree was covered with blossoms, which were pink in bud, white when open, of medium size, with petals of medium width. Fruit ripe August 30th. Size, 1 inch across and one inch deep. Color, brilliant yellow and crimson Flesh crisp, juicy, acid, flavor good, almost free from astringency, excellent for jelly. Deficient in size of fruit, but promising for its earliness, quality and profuse bearing habit.

All these varieties are remarkable for the persistent manner in which the fruit is attached to the tree. The stems are so firmly fastened that they require a considerable effort to detach them. The trees are all very strongly built, with the branches bound to the trees with bundles of woody fibre which are difficult to break. Root grafts were made of some of these varieties two years ago on account of their thrifty growth and promising appearance and sent to the western experimental farms where they have stood the test of one winter; a further supply was sent for the same reasons last spring. Now, that these five have fruited and

promise to be of value, they will propagated more freely and tested in different parts of the northwest country. There seems every reason to expect that they will prove hardy, and if they can be grown by the average farmer there under ordinary conditions, they will undoubtedly be much appreciated.

As the five varieties described have all been selected from the first 36 of these crosses which have fruited, it is probably many other equal and possibly superior sorts may be found as other cross-bred sorts come into bearing. The work of cross-fertilizing has been continued and there are yet 270 of the crosses on *Pyrus baccata* which which have not fruited. These include crosses with Duchess, Yellow Transparent, Wealthy, Simbirsk, Oeimoe, Kursk Anis, Krimskoe, Herren, Pewaukee, Tetofsky, McIntosh Red, Excelsior, Broad Green, Haas, Scott's Winter, Ribston Pippin, Red Astrachan, Anis, Talman Sweet, McMahan White, Red Anis, Swayzie Pomme Gris, Fameuse and Beautiful Arcad.

A number of crosses have also been made on another wild form of Siberian Crab *Pyrus prunifolia* which produces fruit naturally of nearly double the size of *Pyrus baccata*, and its hardiness has been established by tests of several years at both of the North-west experimental farms. The first crosses were made on this species in 1896, and the seed germinated in the spring of 1897. The young trees grown that year were planted out in orchard in the spring of 1898 where most of them are growing well. The number of these crosses are about 200 and pollen was used for crossing from the following cultivated fruits · Red Astrachan, Duchess, McMahan White, Simbirsk, Herren, Pewaukee, Haas, Golden Russet and Winter St. Lawrence. The extra size of the natural fruit of *Pyrus prunifolia* will, it it hoped, result in the production of cross-bred fruits of larger size.

The result here reported are but the first steps in a series of experiments which are full of interest, and promise to be of much value to the settlers over large areas in the Dominion. The seeds obtained from the most promising of these crossbred sorts are being preserved and sown and from them many interesting sports may be looked for. Now, that the continuity of nature has been broken by the work of cross-fertilizing it is proposed to carry on selection with seedlings of these crosses from which fruits of increased size and improved quality will probably be obtained. From these sources it is expected that within a few years a number of useful sorts of apples will be had, ripening at different periods which will endure the climate in most of the settled parts of the north-west country.

Last year I ventured to say that no success had been had in growing the larger fruits there in the Northwest, such as apples. During the past year, however, you will have noticed paragraphs announcing the fact of the ripening of numbers of apples of Russian varieties at different points in Manitoba, and this seemed quite contrary to the statements which I made to you last year. I took pains when in Manitoba this year to investigate this unusual condition of things. I visited Mr. Stevenson, who has had most success. His farm is at Nelson, six miles from Morden in the southern part of Manitoba, and he is at an elevation of about 700 feet above the sea, and in an exceptionally sheltered spot. He had ten or a dozen small apple trees, the trunks of which would probably measure four or five inches in diameter and standing ten or twelve feet high, on which there were a good many specimens of well-known Russian varieties of apples. It is the most successful year he has ever had, but his place is sheltered by a dense mass of wood on two sides, preventing any cold winds from reaching him, and his orchard itself is grown up. The trees are planted between every two or three rows of trees. There is a row of evergreens that are nearly as tall as the trees, so that in order to see the trees you have got to get right in amongst them they are so much sheltered. Mr. Stevenson remarked to me, "I know I have succeeded in growing apples here better, perhaps, than anybody else in Manitoba, but I doubt if anybody outside my own place, unless he had equally good conditions, could get the same results as I have got." When I arrived at Brandon I found

some very nice samples of apples which the Archbishop of Rupert's Land had sent up from Winnipeg, and he gave the details of how many apples he had to each tree, varying from 5 to 55 apples on the tree. This surprised me very much, but on my return I spent a day in Winnipeg to see how it was that apples had been so successfully grown at this point. On visiting the Archbishop's garden I found it also on the banks of the Red River, very exceptionally sheltered with woods on the north and west sides. It also was enclosed with a high board fence and when I came to examine the trees, I found that the fruit had all been borne below the snow line—that is, that the wood all above the snow line had been killed, and the apples had all been matured within about three feet of the ground. The trees had made a rapid new growth above where the fruit had been, but the results satisfied me notwithstanding fruit had been grown there and ripened under those exceptional conditions, that as a general thing people could not grow these varieties of apples under ordinary conditions of exposure. I thought this statement was needed in view of the statement I made last year, and which seemed to be contradicted by the reports in the newspapers.

Mr. CASTON: Were those dwarf trees?

Mr. SAUNDERS: They were dwarf, but I do not think they were what we call dwarfs. They were dwarfed by the weather. We have had similar experience to that in Brandon, as far as dwarfing the trees is concerned, but we have not matured any fruit on the trees. Every year for ten years they have been killed down to within two or three feet of the ground. In this case of the Archbishop's the tree had carried the buds through and matured the fruit the following year, but all the fruit buds were below the snow line, and the high board fence would help to collect the snow. There would have been three or four feet of snow in that garden in the winter; and practically it does not do away or lead one to modify the general statement that such fruits cannot be grown in that country under ordinary conditions. The further remarks I wanted to make relate to the new hybrid fruits suitable for growing in the North-West. I have still one more cross to bring to your notice, and that is the cross between the Sand Cherry and one of the wild American plums known as Colonel Wilder. The Sand Cherry most of you know well, and you will observe that this fruit, which is intermediate in the character of its foliage between the Sand Cherry and the plum, is also intermediate in size between those two fruits. The quality of the hybrid is much better than the Sand Cherry, and it may possibly be a useful fruit for the North-West. At any rate it is interesting as a scientific development of the work of cross-fertilizing, and I believe it is likely to stand the climate of the country and be useful to the people. (Applause.)

Mr. SHEPPARD: You mentioned that in the Archbishop's garden the fruit is borne upon the lower branches that were covered with snow. Has any attempt been made, such as Mr. Smart in New Brunswick carried on for many years with plums there? He raised plums, and laid the trees down over winter—cut the roots on one side and then laid them down and fastened the trees to the ground, and they were covered with snow the whole winter. In that way he preserved the fruit buds and raised large crops of plums. Has that ever been tried in Manitoba on the apples?

Dr. SAUNDERS: Not that I know of anywhere. The orchard of Mr. Stevenson is the only orchard I have seen where fruit has been borne above the snow line, and that success is no doubt attributable to the remarkable shelter which he has. I remember visiting Peter Gideon, lately deceased, several years ago. His orchard is on Lake Montaunk, not a very long way south of Brandon, and I saw some peaches there which he had succeeded in raising by adopting that method. He pulled me one off to try, and I had a chance to eat it while I was there, and it was a very well ripened and good-flavored peach which he had succeeded in producing by adopting that plan; but we have never tried the experiment on

any of our North-West farms, for the reason that not many of the trees we ever planted there have lived more than one season, and there has not been the opportunity of carrying out experiments of that nature—generally been killed out root and branch. It is necessary to have these roots perfectly hardy. For that reason we have raised no stocks from the Pyrus Baccata seed.

MANITOBA AND THE NORTH-WEST TERRITORIES AS MARKETS FOR ONTARIO FRUITS.

Dr. Wm. SAUNDERS, director of the experimental farms, addressed the Association on this subject. In 1888 he first brought this topic before the fruit growers of Ontario in a paper which was presented at the annual meeting of the Association held at St. Catharines in December of that year. In that paper many facts were presented bearing on the extent and promise of the western market for the surplus fruits of Ontario. With a considerable and steady increasing population spread over an area of 1,000 miles in length and from 200 to 300 miles in width, with a number of well established cities and towns and with many new towns and villages springing up all over this vast district, the consumption of fruit is already very large and is increasing with amazing rapidity. Suggestions were made in that paper as to methods of packing and handling of fruit so that it might reach its destination in good condition, and if this could be accomplished a growing demand for Ontario fruits would follow.

Dr. Saunders then referred to what he had seen during his journeys through the north-west country this year and spoke of the improved condition in which Ontario fruit had reached that distant part of our country. He found in all the places he visited abundant supplies of Ontario grapes which were largely taking the place of the California product, hitherto the chief supply. These eastern grapes had reached the market in good condition, were keeping well, and were selling in large quantities at reasonable prices as compared with the past, but still at such figures as would give fair profits to the growers and the dealers. Ontario apples were also well distributed and some fine cases of Ontario grown pears were seen in some of the larger towns. The dealers all spoke well of the fruit, it had in most cases reached them direct in car load lots in excellent condition. On enquiring he learned that over 200 car loads of Ontario's surplus in this line had found a ready sale in the far west during the season and the market was not by any means glutted. With such material to dispose of, much of which is very perishable, he advised that Ontario shippers make business connections with the dealers in different towns and ship direct to them in carefully packed refrigerated cars as often as required. Fruit so supplied can as a rule be offered to the consumer in much better condition than if shipped to one or two business centres and thence distributed. The less such perishable material as fruit is handled and the shorter the time occupied in transporting it from the grower to the consumer the more profitable and satisfactory will this important business become.

HOW CAN WE PREVENT TRICKERY IN PACKING OF APPLES FOR EXPORT ?

A. H. PETTIT : We have considered this matter for a time, and we would adopt the suggestion given us by Prof. Robertson, but the details of the scheme is something that we should not hurriedly put through. However, we think for

this meeting the suggestions made by Mr. Robertson this morning might be fully and thoroughly discussed, and the committee later on, after hearing the full discussion on the suggestions made, would probably be in a position to make a report that would be of value to this Association. There is one point in which we do differ for the present in regard to Mr. Robertson's suggestion, and that was that it would be unfair to place the grower's name upon the package over which he has no control. (Hear, hear.) The packer's and the shipper's name might fairly be put there, but not that of the grower who sold his fruit to the shipper and placed it outside of his control, as to the condition and quality of fruit contained in the package.

Mr. TWEEDLE: There would be another difficulty right along that line. One of the details of it is that a great deal of fruit is sent away to the warehouse and repacked. I do not see how the owner could be responsible for anything after that.

The PRESIDENT: As I understood Prof. Robertson, the grower was not responsible at all. His name was there merely as a matter of reference, but no responsibility attached to it whatever.

Mr. PETTIT: A great many Canadian growers have a very good name in the British market, and if the shipper was to put the grower's name on it when he had no control of the package, it might ruin his good name in the British market; therefore he must be protected in some way.

E. D. SMITH: In discussing this in the few minutes we had at our disposal at noon in the committee we felt the suggestions of Prof. Robertson were on the right line, and had struck a solution of the difficulty we had never been able to reach before. It had been suggested in other years that a grade of a certain size, say $2\frac{1}{2}$ inch apple, should be regarded as No. 1, and a $2\frac{1}{4}$ inch apple as No. 2, or something like that, and we felt that that would not meet the difficulty—that we could hardly specify what would be regarded as the size of a No. 1 apple. That difficulty was met with that suggestion to-day, that the minimum size be marked on the head of the barrel. A man might put up whatever he liked, but it must be marked on the head, with an allowance, as he suggested, of ten per cent., which I think would be very reasonable. That part the committee quite agree with. Then they suggested that the grade marks for quality should be Fancy, A1, No. 1 and No. 2—making four grades. That is a matter subject for discussion here. But one thing that we did not attempt to discuss, and felt it would take a good deal of time, is the matter of compulsion—whether everybody should be compelled, who put up their apples in this country, to put their marks on them, or whether it should be optional, that was a matter we could not come to a conclusion upon, for the reason that we should like to hear this matter discussed at this meeting, and give us leave to sit again and report at some future date.

Mr. HUGGARD: I think it is absolutely necessary to have a guide as to what is a No. 1 apple. I understand this committee was appointed for the purpose of designating what would be No. 1, No. 2, etc., acceptable to the Government and to purchasers. In the Toronto fruit market you will see all manner of fruit marked No. 1, when I would call them No. 3 or No. 4, and in some instances something like these in our baskets here, that are not even fit for a cider mill. The very fanciest varieties you have got I would call No. 1, and I should designate apples nearly as large, not so highly colored, with no spots, no worms, no rot, no bruises, all perfectly sound as No. 2.

A. H. PETTIT: As a basis for this, suppose we say that an apple that should rank A No. 1 should be an apple of fair size of the variety it represents, free from scab, worm hole and bruises, and properly packed. Now, I would ask you what size you would put a Baldwin to come under that head? Would you put a $2\frac{1}{2}$ inches, $2\frac{3}{4}$ inches? These are the little detailed points that we want to first con-

sider before we submit a report as to what will constitute these different grades, taking the various kinds. You come to the Kings, and where will your A 1 be there ? Will it be 3 inches or $3\frac{3}{4}$ inches ? These points all want to be carefully considered before submitting the standard to the Association for approval ; and you may go on down to the various grades of apples in that way. It would be well if we could adopt a scale and have them stamped on the barrel ; and we want your views on the variety and how they would range.

Mr. HUGGARD : I would submit that an A No. 1 extra quality of Baldwin should not be less than $2\frac{3}{4}$ inches ; a King should not be less than 3 inches, neither should a Spy. These would be extra, and colored accordingly. Now, a Spy of three inches in diameter that is all green in color I would not rank as an A No. 1 apple, though perfect in every other way. The color has everything to do with Snows, Kings, Baldwins and all those colored apples. Take a barrel of Spys that there are very few red ones in, and you will not get a very high figure for them. We often see those barrels opened up in Toronto, Montreal and in our local markets, with apples all the way from $1\frac{1}{2}$ inches up to $3\frac{1}{2}$ inches in the same barrel. This barrel could not be graded anything, and it would not sell for very much supposing the apples were all sound, which they are not generally ; but take the largest and most highly colored out of those apples and make a grade of them, and take the next and make a grade of them, and throw the smallest ones out altogether, then the buyer and seller would know just what they were worth. If I were a law-maker I certainly would make it criminal for any one to forward such apples as that to any country, or even to our own private market. A baker the other day in our own town came in with his bread wagon to sell bread, and it was reported to the chief constable that the bread was light. He went and tested some 30 or 40 loaves, and the poor of the town had the benefit of the bread at the expense of the baker. If a producer will not put the goods on the market at the price that he has a right to ask, have a standard whereby, both producer and consumer can prove as to its merits.

Mr. BOULTER : While we have a good name for apples in the Old Country it behooves us to see that the packing is carefully watched. We can produce the best apples in the world. The business men down near the Annapolis valley want Ontario Spys and Baldwins. I have always believed that inspectors would remedy the present evils we have to meet. The law in canned goods is that if the name of the packer is not on the package he is liable to pay $2 for every can so put up. $24 for a little case of goods is a pretty serious thing. We have followed that up and punished men for violation of the law. It is the same thing with apples. My theory is to start this thing right. I do not think it is wise policy for a large fruit grower to be a speculator in it. I think you have got started to-day pretty near on the right basis. Prof. Robertson has outlined something from his long experience that is of value. I believe that whoever sells an apple, who is responsible for the sale, as I am for my goods, his name must be there imperatively, and it ought to a statutory law that if he sends goods out of Canada or sells goods in Canada, his name ought to be there as a guaranty of good faith, not put a fictitious brand of any kind. Make the man responsible that puts the article up. Throw the responsibility on him, and make him liable to lose his fruit. If you send a car of goods to British Columbia and they find one barrel infected with worms, they will burn that whole car before your eyes. I was buying peaches in Toronto for three years, and I came to the conclusion there was not an honest peach packer in Canada. (Laughter). I would not like to say that about the peach packer only ; I would like to say he had friends among the apple growers.

The PRESIDENT : I am satisfied this committee now will be able to bring in a report.

REPORT OF COMMITTEE ON FRUIT PULP.

By W. Boulter, Picton.

You appointed a committee last year to take into consideration the shipping of our surplus fruit pulp to the old country. I had connected with me Rev. A. J. Andrewes and Mr. Alex. McNeill. I had shipped over some samples last year. In April I went over to England, and the parties who had been writing in regard to this fruit pulp were my own brokers in London, Messrs. Anderson & Coulton, I interviewed them in regard to it. I sent the letter over to our worthy secretary. I am not going to read that letter to you. The question was whether our raspberries could be successfully made into pulp and shipped over. We are not able to make jam in Canada and compete with the Englishmen. The idea is for him to get fruit, as he does, that does not cost him more than 5, 6 or 7 cents a pound. He wants to put as much sugar in it as he possibly can, because he buys the sugar for 1½ d. a pound, and the more sugar he puts in the more profit he makes out of that pulp. I had a talk with my brokers, who had first introduced this subject, and I came to the conclusion it was rather precarious business. However, I came home about the first of June. When I left London the season had not been very favorable, a little too dry; the crop of raspberries was not likely to be very large. I wrote Mr McNeill that I was ready to go on and put up the goods; but I received no reply. I wrote again and received no reply. Mr. McNeill apologised to me that he did not write, and I said, "Well, perhaps you did'nt because under the circumstances you thought the crop was going to be so light that it would not do to make any sacrifices and put it into pulp; you would make more money the way it was." That is about the sum and substance of the business this year; the crop was not so large that there would be any advantage to put it up and ship it to the old country. You heard Prof. Robertson say last year that if certain prices could not be realised there would not be much result. However, I came home and bought up a lot of the Shaffer raspberry. It is not a real good salable raspberry in Canada along side of the Cuthbert, but it makes splendid good pulp, it is good color. I put up fourteen tons of these raspberries into pulp, under the ordinary process, in gallon cans, the same as the gallon apples that you see exposed for sale. The brokers had written me that taking all things into consideration that was the most desirable package to send over. I sent samples of the goods over. The quotation Prof. Robertson gave you was from £20 to £30 per ton of 2240 lbs. The letter I received from the brokers says that the ordinary prices range from £18 to £20 per ton of 2240 lbs., and it was not till something like a week after that it jumped up to £40, sometimes to £50. Well, if we could get £40 a ton a little money would result to the grower of these berries at five cents a quart. However, there have been no such prices as that since we put up the goods. I wrote to Hon. Mr. Fisher, and he said as soon as Prof. Robertson got back he would correspond with me and see what could be done. In conversation with Prof. Robertson to-day he wished me to send over a ton to be distributed among the large buyers. I made the proposition to you to send your raspberries to me and I would put them up at actual cost. It would not have paid you this year to have done it, even to have sent them a mile or two miles from your place of growth, because if you can realise five cents a quart, don't take any chances of putting them up into pulp. It will not pay as the expenses in connection with it are so great and the chances and competition with the Australian, the French, and pulp from other countries naturally keeps the price low. I am holding these goods back simply because we could not get freight space at a reasonable price. The prices in January are likely to be better than they are now, and I shall report the actual result later on. I shall go on and put up goods even next year. Some

goods have been put up and sold for 25 shillings a dozen. The easy way to put these goods up would be in gallon cans, 7 lbs. to the can, which would mean 84 lbs. to the dozen, and the quotation of 26 shillings which I was offered would be for a dozen of those cans—not by the ton. Taking the shilling at 24 cents. the cost, as near as I can make it up, comes to about $4.80—you can be very safe on that—5 cents per pound. The cans and the cases and the ordinary processing and freight would cost at least 2 cents more, which would make 7 cents laid down; so you can easily figure that 26 shillings for 84 pounds would leave very little money. I will say in conclusion that should the crop of raspberries be large next year, and the prices drop, I will do my best to take your surplus stock at a price that will pay you a good deal better than throwing it away. Perhaps some other packer is willing to invest as I have been.

Mr. SERVOS: Could the raspberries be evaporated and then sent to the Old Country and placed on the market there and answer the purpose of pulp?

Mr. BOULTER: No.

Mr. SERVOS: What would be the best course to pursue in order to realise?

Mr. BOULTER: The old-fashioned way was evaporation, or drying naturally. At present I do not know any other way unless you can get somebody who can put them up in these cans in the natural state. They must be sweet when they are put up. You could not make an article strong enough to hold it if it went into fermentation crossing the ocean.

Mr. SERVOS: Would it not be possible to employ some person to come right on the premises and do the work?

Mr. BOULTER: If you had a large quantity.

Mr. SERVOS: Would twenty acres be enough,

Mr. BOULTER: Oh, yes; five acres would be sufficient. What variety are you speaking of?

Mr. SERVOS: These are wild raspberries.

Mr. BOULTER: Yes, that would be a good point. They would make good jam, but you could not get pickers. I tried this. You could not get pickers to pick wild raspberries so that you could make any money and put them up. If you got beyond 4 or 5 cents a quart you could not make any money at the prices I quoted you. If you can sell them at the home market, sell them, if you can get 4 cents a quart nett, do not attempt to do anything else only sell them.

Mr. SERVOS: I had everyone of them sold in Toronto this year but could not get pickers.

Mr. BOULTER: You could not make any money with picking at that price,

Mr. SERVOS: What is a pound equivalent to?

Mr. BOULTER: A pound is an imperial quart.

Mr. SERVOS: They wanted three cents a pound.

Mr. BOULTER: They wanted all there was in it.

After some discussion it was decided that the committee appointed to report on the suggestions of Prof. Robertson be authorized to confer with that gentleman and take such action in the matter as circumstances might require.

MUSHROOMS.

BY REV. DR. HARE, PRINCIPAL OF WHITBY LADIES' COLLEGE.

Mushrooms are a kind of fruit that are not very well known even by fruit growers, and I may tell you that we had baskets full of these mushrooms that were really palatable and nutritious—more nutritious than any kind of fruit that you grow in your orchard—and these were simply wasted, thrown away, because we did not understand that they were edible and nutritious. When you come to

know that mushrooms rank next to meat in nutritive qualities, that they are even more nutritious than peas or beans, then you come to understand that they are an article of diet that we should not despise. The kind of mushrooms that grow in our college grounds are three. There is the common Meadow mushroom that you are all acquainted with. Then there is the larger and coarser mushroom, but very much like it, known as the Horse mushroom. That was found in considerable quantity around our college hot bed. Then there is what is known as the Fairy Ring mushroom. This was rather troublesome in our lawn grass. The grass grew quite green amidst the mushrooms, and it rather spoiled the general appearance of the lawn, and we were doing all in our power to exterminate these mushrooms. I gave instructions to the man to go and destroy them the moment they put their heads above the soil. Now we are glad to see them there, and we go and pick them up, and we find them very nutritious and palatable eating. Then I may say there are two other mushrooms found within the corporation that are really valuable. One is the *Cobrinus commodus.* Some are very much afraid of this simply because it turns to ink when it decomposes. You will find a quantity of that peculiar species in this neighborhood. They are quite plentiful this autumn. They look, when closed, like an umbrella closed, and then when they open out they are somewhat bell-shaped, or like an umbrella somewhat open, and they are rather light colored on the outside, a little dark at the top of the cap, and the cuticle rather splits up into shaggy scales, and it gets the name Shaggy mushroom. The gills are white at the outside, then they begin to turn pink at the edges. It next turns black and begins to decompose, and then it just simply turns into ink and disappears. Then we have in Dr. Waugh's grounds a very fine species of Morell. This mushroom is not known because it is not a gill-bearing mushroom. It looks like a honey-comb on the outside and the spears are developed on the outside of the mushroom instead of beneath the cap on the gills. I may say that in the township of Oro in the county of Simcoe the Morell is very much prized. Dr. Waugh was teaching there some years ago, and he was telling me that it resembled in taste a very tender leg of chicken, somewhat midway between the taste of a chicken and the taste of very delicate lamb. Now, when you find that the percentage of proteids or albuminous matter that may go to build up the system is exceptionally large in these Morells, and that they are such delicious eating, certainly we ought to be able to recognize such friends of ours when we see them. Then I may say that there are no less than four different species of puff-balls found in the college grounds. Some people are afraid of them. Now, there is not a single poisonous puff-ball known to science. All these puff-balls are good to eat if we get them when they are young and white in the centre. If they begin to turn yellow and there are streaks through them, then they are not fit to eat. There is one little puff-ball known as the Calpsin puff-ball; then there is another called the Warty puff-ball that is very common in our college grounds, sometimes three or four together, quite warty on the outside. They are more compact in structure than the first one I have referred to. Then there is a pear-shaped puff-ball and out at Tweedie's woods there are two very fine species of puff-ball known as the Albertum and also the Gigantum Zendiform, that is the January puff-ball. I have in the college museum a sample of the January puff-ball that must have been much over a foot or a foot and a half in diameter. These puff-balls are delicious eating. I have had the pleasure of eating some of them and thoroughly enjoyed them, and where we could find access to one of these large puff-balls we can simply cut a slice off the upper part of it and serve it for dinner to-day, and then wait and come along the next day and cut off another slice, and the puff-ball will continue to grow, and unless we are very extravagent in our ideas it may continue there for some days and afford us delicious eating. If I had time I would like very much to go into the classification of puff-balls, their structure, their life-history, and

then perhaps to make some drawings that would illustrate what I had to say. I thank you very heartily for the privilege of making these remarks, and I hope that those of you who do find puff-balls in your neighborhood will become enthusiastic. I do not profess to be an expert, but I say this, that I have unbounded interest in the subject, and that the more I learn respecting mushrooms the more enthusiastic I become.

The PRESIDENT : I am satisfied there is no article this country produces so edible as mushrooms. I am very glad the Doctor brought that question up.

PREPARATIONS FOR A DISPLAY OF CANADIAN FRUITS AT THE PARIS EXPOSITION.

BY PROF. SAUNDERS, DIRECTOR EXPERIMENTAL FARM, OTTAWA.

In planning for a representative exhibit of Canadian fruits at the Paris Exposition in 1900 it was necessary to consider the subject from several standpoints. The time of holding the Exposition, from the 5th of April to the 30th October, has an important bearing on the material to be exhibited. The first point to consider was what fruits could be shown in a natural condition within the time named, and how they could best be preserved so as to maintain a continuous exhibit. In this connection, also, it was necessary to consider how the softer and more perishable sorts of fruit could be kept so as to show them of their natural size, form and color.

It was decided to undertake the preservation of the perishable fruits in antiseptic fluids and to secure some of the best specimens of these products from all the more important fruit-growing sections in the Dominion. To this end there have been filled in all more than 1,700 jars. These containers are of various sizes, from one pint to five gallons each, are made of the clearest and finest glass so as to show the fruits off to the greatest advantage.

Of these glass jars 794 have been filled with fruits grown in Ontario ; 402 with those of Quebec ; 258 from Nova Scotia ; a few from New Brunswick, and 28 from Prince Edward Island. Forty-eight have been filled with cultivated small fruits and wild fruits of Manitoba and 31 with those of the North-west Territories, while 188 jars have been received from British Columbia. The following preservative solutions have been used : 1st. A two per cent solution of Formalin in water for strawberries, some of the red raspberries, blackberries and red currants ; 2nd. A two per cent. solution of boracic acid for cherries, red and black currants, gooseberries and some varieties of raspberries, also red and black grapes, plums and apples ; 3rd. A three per cent. solution of chloride of zinc. which has been found very useful in preserving white currants, white raspberries, and green and russet apples ; 4th. A solution of sulphurous acid made by mixing one pint of commercial sulphurous acid with eight pints of water, which has proved an excellent preservative for all light colored fruits. To all these watery solutions ten per cent. of alcohol has been added to prevent danger of freezing during transportation.

The collection of fruits preserved in fluids consists of the following : Strawberries, 137 ; red, white and black raspberries, 203 ; blackberries, 27 ; red and white currants, 177 ; black currants, 13 ; gooseberries, 121 ; cranberries, 9 ; plums, 208 ; peaches, 30 ; quinces, 3 ; apricots, 2 ; cherries, 85 ; grapes, 108 ; pears, 122. and apples, 455. Most of these latter are early maturing sorts. Additional jars of the later maturing fruits will be filled in Paris from the fine selection sent there to be shown in a fresh condition.

In making selections of fresh fruits, which are being preserved in cold storage in Montreal until the time for exhibiting them arrives, it was decided that the

display in this section should be confined to apples and pears and that our commercial varieties should be made the most prominent feature. It was, however, thought best, in order to more fully illustrate the capabilities of the different climates of Canada, and at the same time make the exhibit more interesting and attractive, that a considerable number of varieties should be secured; but no attempt has been made to preserve any variety earlier in season than the Fameuse. From that period onward, selections have been made of all the most desirable apples and pears which could be obtained. The fresh fruit has all been packed in bushel boxes, the Cochrane case, with a separate paper compartment for each specimen, having been chosen for this purpose. The fresh fruits have been secured from the different provinces as follows:—Ontario, 96 boxes, and nine to follow, Quebec, 130 boxes; Nova Scotia, 83 boxes; New Brunswick, 50 boxes; Prince Edward Island, 24 boxes; and from British Columbia, 68 boxes, making 451 boxes in all, which will probably be increased to about 500 when all the fruits selected are in.

Those received are now in cold storage in Montreal, from whence they will be forwarded in good season to Paris, using, if necessary, cold storage in transportation and placing them in cold storage on arrival there, and taking them out of cold storage from time to time as required for the display. In this way it is hoped that an attractive exhibit of fresh fruit will be provided, giving prominence to all our late keeping winter varieties for two or three months after the Exposition is opened. As the specimens shown cease to be useful for the fresh fruit exhibit, samples will be put in glass jars in antiseptic fluids, so as to add to that portion of the display.

In getting this large and comprehensive collection together, the following gentlemen have rendered excellent service: Mr. A. McD. Allan, of Goderich, Ont., who has had charge of the work for Ontario; Prof. H. L. Hutt, of the Ontario Agricultural College, Guelph, who has undertaken the work of preserving the more perishable fruits brought together by Mr. Allan, and has put up 596 jars; Mr. W. T. Macoun, horticulturist of the Central Experimental Farm, who has put up 161 bottles, containing samples of the fruits grown on the Central Farm; Mr. R. B. Whyte, of Ottawa, who has contributed a nice collection of early fruits from his own garden, numbering 17 specimens; Mr. Robt. Hamilton, of Grenville, Que., who has collected all the fresh fruits from Quebec and put 230 samples in preserving fluids of fruits grown in the western part of that Province; Mr. Albert D. Verreault, of Village des Aulnaies, Que., who has bottled 205 samples, representing the eastern sections of Quebec; Mr. J. W. Bigelow, President of the Fruit Growers' Association of Nova Scotia, Wolfville, has brought together the larger part of the fresh fruit collected in that Province; Mr. C. A. Patriquin, of Wolfville, who has assisted Mr. Bigelow in collecting the fresh fruit and has conducted the work of preserving 89 of the more perishable sorts in fluids; Mr. Thos. A. Peters, of Fredericton, Deputy Commissioner of Agriculture for New Brunswick, who has undertaken the work in that Province; and Mr. J. S. Clark, who has made the collections for Prince Edward Island. Such small fruits as can be grown successfully in Manitoba have been collected by Mr. S. A. Bedford, superintendent of the Experimental Farm at Brandon, who has contributed 48 specimens, and similar work for the Northwest Territories has been done by Mr. A. McKay, superintendent of the Experimental Farm at Indian Head, who has sent 31 sample jars. In British Columbia Mr. J. R. Anderson, Secretary of Agriculture, Victoria, has done excellent work in collecting fresh fruit from the more important fruit growing districts of that province; while Mr. Thos. A. Sharpe, superintendent, has forwarded a good collection of fresh fruit from the Experimental Farm at Agassiz, and has also put up in preserving fluids 188 jars of the more perishable and early ripening fruits grown on the Experimental Farm for British Columbia.

A good location for the display of Canadian fruits has been secured in the Imperial space in the main building devoted to horticulture, where Canadian fruits will be placed side by side with those from other fruit producing countries. A further display will be made in a suitable space provided in the Canadian building. It is also proposed that examples of the early ripening Canadian fruits of the growth of 1900 be sent to Paris in cold storage in August and September of that year, so that a good impression may be made with fresh Canadian products during the closing weeks of the exhibition. It is believed that Canada will make an excellent showing on this occasion, which will demonstrate to the world her capabilities as a fruit-growing country, and, with the evidence submitted by this exhibit drawn from fruit-growing areas from the Atlantic to the Pacific, convincing testimony will be afforded of the suitability of the Canadian climates for producing fruits of the most attractive character and of the highest flavor.

GOOD ROADS FOR FRUIT GROWERS.

Mr. A. W. Campbell, Government Instructor in Roadmaking, Toronto, delivered an interesting address upon the subject of good roads, and urged the appointment of a committee to assist in the work of road improvement.

The Secretary: I think perhaps it might be wise for us to appoint a committee on Good Roads, as was suggested by Mr. Campbell. I am sure that we, as fruit growers, are as anxious that we should have good roads throughout our country as any others in the Province. I would move the following Committee on Good Roads, and if they could form any resolution to send in to the Minister of Agriculture, it would be a good move in this direction:—E. Lick, Whitby; G. C. Caston, Craighurst; Harold Jones, Maitland.

Mr. Huggard seconded the motion, which was carried unanimously.

VOTES OF THANKS.

Your Committee on Resolutions beg leave to further report—

That it be resolved, that a hearty vote of thanks be tendered to the mayor and corporation of the town of Whitby for the use of the Music Hall for the annual session of the Ontario Fruit Growers' Association; also to the following persons, Misses Mitchell, Perley, Crysdale and Yorke, for their valuable services in furnishing music for the evening sessions; also to Dr. Saunders, Prof. Macoun, Prof. Hutt and Prof. Robertson for their valuable papers and addresses; also to the several persons who contributed exhibits of fruit.

Finally, that the sympathy of the Association be conveyed by the Secretary to Messrs. T. H. Race and A. M. Smith in the illness that has prevented their attendance at this meeting.

THE MANCHESTER SHIP CANAL.

Mr. R. Dawson Harling, of Toronto, then gave a lecture on the Manchester Ship Canal, illustrated by stereopticon views, Mr. Maughan working the instrument. Mr. Harling said his subject was a continuation of that spoken of so well by Mr. Campbell this evening—that of transportation. By means of that marvelous piece of engineering work, the Manchester Ship Canal, Manchester stands in relation to the transportation question as a seaport like Liverpool, though it is thirty-five miles inland. The Manchester canal, though one of the wonders of this century, was mooted—in relation to sailing vessels—over a hundred years ago; but, if it had been built then, it is certain it would not have accommodated the

steamships of the present day. The present canal is capable of carrying the largest cargo boats of to-day, steamers capable of carrying up to 9,000 gross tons. The canal runs from the Mersey, near Liverpool, right through the heart of the country. The canal was built in spite of tremendous opposition from the harbour companies, of enormous capital, and from various railroad companies. The bill was thrown out of Parliament three times; and even when it passed, the canal was built through opposition inch by inch from landholders and others. Why was the canal necessary? About the year 1875 competition became so keen that it was almost unprofitable to manufacture cotton, and in most cases the mills were closed down. This continued for five or six years; and if the decadence went on for ten or fifteen years, there would have been no city of Manchester so far as the cotton trade was concerned, and to the enormous population which surrounded the city the matter was serious. A commission was appointed to investigate, and they reported that the cause of the whole trouble was the excessive charges upon their foreign raw materials at the port of debarkation, and for bringing those materials from the sea coast to Manchester. The only solution was to be found in the building of light railways from Liverpool to Manchester, or to build the canal. The railways had taken up all the attention and nearly all the capital; but the canal came to the front, with Daniel Buchanan as the prime mover. Five years ago last January it was opened. The great increase in the size of ships a year or two after the opening gave rise to predictions of failure, but these were soon dispelled. One of the chief factors in transportation is to have your produce carried to the consumer in the most direct way and in the cheapest way. The Canal Company made up their minds that a canal without a steamship line would be of very little use; so the steamship company was formed in the opening of 1898, with a million pounds sterling capital, called the "Manchester Liners, Limited," and they decided that their first trade should be exclusively between Canada and Manchester. They began by buying two boats —the Manchester "Enterprise," which foundered in the Atlantic week before last, and the Manchester "Trader." Then they put on the stocks seven new boats, that are some of the finest going out from Canadian ports. They run from 7,000 to 9,000 tons dead weight, and are fitted with cold storage and every possible means for carrying perishable products over and landing them on the other side in the best possible condition.

The Secretary moved a hearty vote of thanks to Mr. Harling for his kindness in giving us the address and bringing the beautiful views before us. The motion was carried unanimously amid applause.

Mayor Rutledge: I have great pleasure in moving a hearty vote of thanks to the President and Secretary, and to the various members of the Association, and the gentlemen who have been present with us in the past two evenings, for their very great kindness in visiting the town, and for giving us the mass of excellent information which they have. I feel that the town and this part of the country will be forever indebted to the Fruit Growers' Association of this Province for their very great kindness in these ways.

Mr. Huggard: I rise to second this motion with the greatest possible pleasure, and I am quite sure that every citizen of the town of Whitby will endorse it very heartily. It is five years since the question was asked, "Will you come here to make us a visit?" You promised to do so, and you have kept your promise faithfully and well; and such a mass of information has not been given to any people for a long time.

The motion was carried amid applause.

The Secretary, in acknowledging the vote, said: We have been delighted with the reception we have received in your town. Everywhere we go we have to become acquainted before we are understood. Some towns think we are bringing some show, and that we want to make money out of the affair, and it takes

some time to convince them that we are trying to be of public benefit, and to gather such information for our report as we can from the people who attend our meetings. We have gathered information from you, and appreciate all the kind words you have given us.

The Convention closed by singing the National Anthem.

LIST OF AFFILIATED HORTICULTURAL SOCIETIES.

Name.	*President.*	*Secretary.*	*No. of Members.*
Arnprior	Claude McLachlin	George E. Neilson	58
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Millbrook	Geo. Sootheran	W. S. Given	60
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Norwich	J. D. Hogarth	Wm. Fairley	50
Oakville	Wm. Savage	W. W. Paterson	118
Orangeville	John McLaren	Wm. Judge	80
Owen Sound		Jas. Vair	61
Paris	Paul S. Wickson	Gordon J. Smith	60
Picton	J. Roland Brown	W. T. Ross	78
Port Colborne	Rev. J. Smith	A. E. Augustine	56
Port Dover	Peter Lawson	W. J. Carpenter	80
Port Hope	H. H. Burnham	A. W. Pringle	118
Seaforth	Wm. Ballantyne	F. G. Neelin	73
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SIXTH ANNUAL REPORT

OF THE

FRUIT EXPERIMENT STATIONS

OF

ONTARIO,

UNDER THE JOINT CONTROL OF THE

ONTARIO AGRICULTURAL COLLEGE, GUELPH

AND THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO

1899

(*PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO:*)

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1900.

SIXTH ANNUAL REPORT

OF THE

ONTARIO FRUIT EXPERIMENT STATIONS

1899

To the Honorable John Dryden, Minister of Agriculture for Ontario :

SIR,—In submitting to you the Sixth Annual Report of the Ontario Fruit Experiment Stations, we desire to call your attention to the steadily increasing value of the matter contained therein. Your Board has to a large extent done away with tables and asked the experimenters to reduce their reports to paragraph notes, believing they will be more appreciated by the general reader. We also desire to call your attention to the results of an experimental shipment of Rogers' grapes, sent to Manchester under your instructions, which were sufficiently encouraging to lead us to count upon eventually opening up a good market in Great Britain for our best varieties.

We have the honor to be, Sir,

Your obedient servants,

JAMES MILLS, Chairman.
LINUS WOOLVERTON Secretary

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THE ONTARIO FRUIT EXPERIMENT STATIONS.

Name.	*Specialty.*	*Experimenter.*
1. Southwestern	Peaches	W. W. Hilborn, Leamington.
2. Niagara	Tender Fruits	* * * St. Catharines.
3. Wentworth	Grapes	Murray Pettit, Winona.
4. Burlington	Blackberries and Currants	A. W. Peart, Freeman.
5. Lake Huron	Raspberries and Commercial Apples	A. E. Sherrington, Walkerton.
6. Georgian Bay	Plums	J. G. Mitchell, Clarksburg.
7. Simcoe	Hardy Apples and Hardy Cherries	G. C. Caston, Craighurst.
8. East Central	Pears and Commercial Apples	R. L. Huggard, Whitby.
9. Bay of Quinte	Apples	W. H. Dempsey, Trenton.
10 St. Lawrence	Hardy Plums and Hardy Pears	Harold Jones, Maitland.
11. Strawberry sub station		E. B. Stevenson, Guelph.
12. Gooseberry sub-station		Stanley Spillet, Nantyr.
13. General collection of fruits for descriptive work including	Cherries	L. Woolverton, Grimsby.
14. Algoma	Hardy Fruits	Chas. Young, Richards Landing.
15. Wabigoon	Hardy Fruits	A. E. Annis, Dryden.

FRUITS OF ONTARIO.

DESCRIBED AND ILLUSTRATED BY MR. L. WOOLVERTON, SECRETARY OF THE ONTARIO FRUIT EXPERIMENT STATIONS.

1899.

Fruit growing has become so important an industry in the Province of Ontario, that it deserves every encouragement at the hands of the Department of Agriculture. The Canadian farmer who contemplates growing fruit asks for information on two points in particular, viz., (1) What fruits shall I plant, and (2) how shall I cultivate them? The latter of these questions it is the province of the Ontario Fruit Growers' Association to answer through the Canadian Horticulturist and the Annual Report, while the former question is one that can be solved only by years of patient experimental work by our fruit experiment stations.

Of equal importance is some means of identifying all varieties now grown in our Province, and of knowing with some degree of exactness the size, color, general appearance and real value of these varieties aside from the catalogues of the nurserymen. To meet this latter need, the Secretary, with the advice and approval of the Board of Control, has begun the work of illustrating and describing the fruits of Ontario, and in this work he desires to acknowledge the valuable aid of the various fruit experimenters. The illustrations are all new and original, having been engraved from photographs made the exact size of the fruit samples, except where otherwise specified, and in this way there will in time be made accessible to the Ontario fruit growers a complete guide to all the fruit grown in the Province. Such a work necessarily must be slow and tedious, but it is all important that it should be characterized by scientific accuracy, and the writer invites notes or criticism from pomologists generally.

NOTE.—In the following pages an attempt has been made to use the words instead of figures to describe quality and value according to the following scales:—

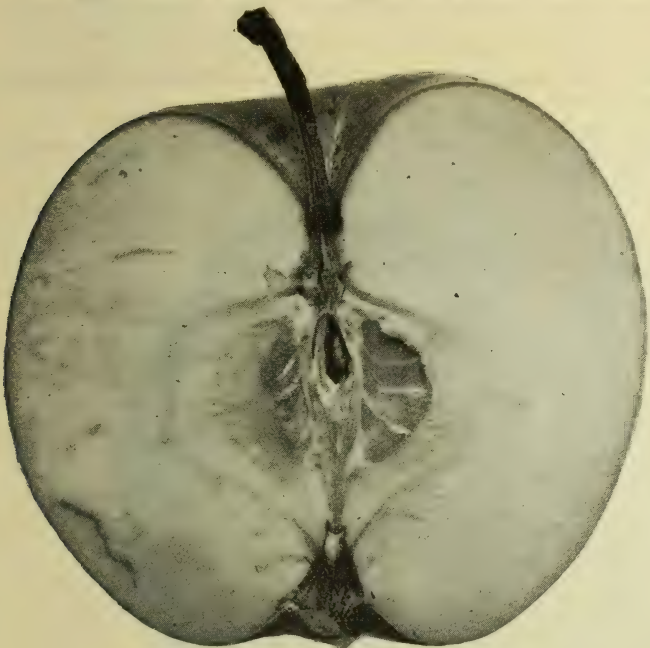
Quality.—1. very poor ; 2-3, poor ; 4-5, fair ; 6-7, good ; 8-9, very good ; 10, first class.
Market Value.—1-3, 4th rate ; 4-6, 3rd rate ; 7-8, 2nd rate ; 9-10, 1st rate.

Exhibit at Industrial Fair, 1899.

APPLES.

CRANBERRY PIPPIN.

An apple that is worthy of being planted in Southern Ontario as a fancy variety for export. Though the quality is ordinary and not suitable for dessert, its extreme beauty when opened in mid-winter, its large and even size, usual freedom from blemishes and the productiveness of the tree every alternate year, make it a desirable variety.



SECTION OF CRANBERRY PIPPIN.

At Maplehurst, Grimsby, in 1895, fifty trees of this variety, about twenty years planted, yielded 200 barrels of high grade apples, and in 1893, when other varieties were almost worthless, nearly the same quantity. Sometimes, however, this variety is subject to warts and knots, which mar its beauty.

ORIGIN, accidental on a farm, near Hudson River, N. Y.

TREE, very vigorous, healthy, spreading, productive.

FRUIT, medium to large, roundish, oblate ; skin, smooth, yellow shaded and striped with two shades of red ; stem, slender, one one-eighth inches long in a deep cavity ; calyx closed in a wide, wrinkled basin.

FLESH, white, firm, crisp, moderately juicy, sub-acid.

QUALITY, fair.

SEASON, November to February.

ADAPTATION, Southern portions of the Province, especially along the shores of the lakes.

CRANBERRY PIPPIN.

DUCHESS.

(*Oldenburg of Downing, Borovitsky of Royal Horticultural Society, 1824.*)

In cold storage, this apple may be profitably exported to Great Britain. It succeeds in every part of Ontario where the apple can be grown, and its beauty always brings for it the top price in the market.

ORIGIN, Taurida Gardens, St. Petersburg, Russia, in 1824 introduced into England by the Royal Horticultural Society in 1824.

TREE, very hardy, very vigorous and an early and abundant bearer.

FRUIT, large, two and one-half inches long by three inches wide ; form, regular roundish,

THE DUCHESS.

SECTION OF DUCHESS.

oblate, one sided ; skin, greenish yellow, with bright red stripes, splashes and numerous russety dots ; stalk, slender, three-quarters of an inch long, set in a deep funnel-shaped cavity ; calyx, long, closed, in a deep broad plaited basin.

FLESH, greenish, turning yellowish white at maturity ; texture, fine firm and juicy ; flavor, brisk, refreshing acid.

SEASON, August and September.

QUALITY, dessert, fair, cooking good.

VALUE, first-class of its season for home market.

ADAPTATION, general. Succeeds fairly well even at our Algoma station, and does exceptionally well on the borders of lakes Ontario and Erie. In Quebec it is counted first in the list of apples for profit.

St. LAWRENCE.

A very good fall apple, of value as a commercial variety along the St. Lawrence river, because of the hardiness of the tree, and at one time widely planted throughout Ontario, but

St. Lawrence.

has now given place to more showy varieties such as Gravenstein, Blenheim and Wealthy.

Origin, Canada.

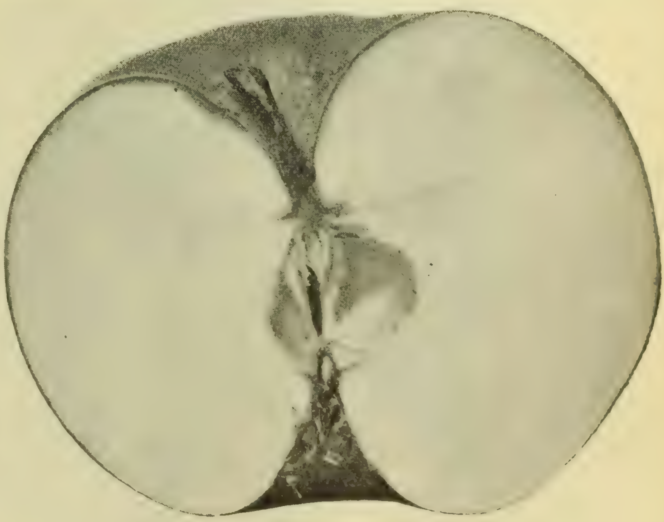
Tree, hardy, vigorous, fairly productive.

Fruit, medium to large in size, averaging about $2\frac{1}{2}$ x $3\frac{1}{4}$ inches ; form, roundish, oblate, inclined to be a little conical ; skin, light yellow with prominent stripes of bright red ; stalk, slender, $\frac{3}{4}$ inch long, set in a deep regular cavity ; calyx, closed, in a narrow deep basin.

Flesh, white, sometimes slightly stained, fine grained, crisp, tender, slightly juicy ; flavor, fairly good and agreeable.

Season, September and October.

Quality, dessert, good ; cooking good.



St. Lawrence.

Value, market, good.

Adaptation, general

SWEET BOUGH.

(*Large Yellow Bough of Downing.*)

An excellent dessert apple, ripening about the same season as the Early Harvest; not subject to scab, and a favorite with those who prefer a sweet to a sour apple. Not profitable to grow for market, but it deserves a place in every collection for home use. Baked whole it is delicious eaten with cream.

ORIGIN, United States.

TREE, of medium vigor, never attaining a large size, and, therefore, even with a full crop, not very productive. Bears full every alternate year; head, compact.

Fruit, large, ovate, conical; skin smooth, greenish yellow; stem one inch long, in a narrow, deep, regular cavity; calyx open, in a shallow, irregular basin.

FLESH, white, fine grained, tender and juicy; flavor moderately sweet, rich and agreeable.

Season, July 25 to August 10.

QUALITY, dessert very good; cooking poor, except for roasting.

SWEET BOUGH.

VALUE, home market, poor to good, foreign market, useless.

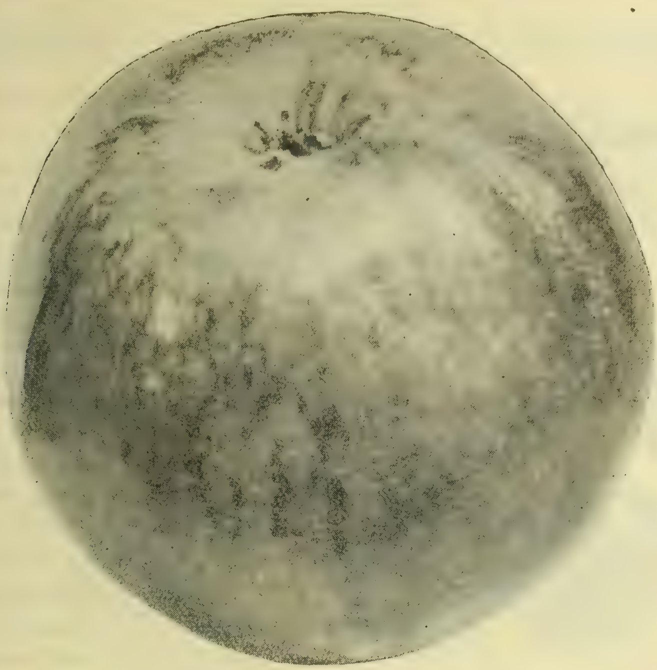
SECTION OF SWEET BOUGH.

ADAPTATION, succeeds well in Niagara district.

TITOVKA.

(*Titus apple.*)

A variety as yet little known or tested in Canada. In season it is about the same as the Duchess, which it somewhat resembles, except that it is oblong, while the former is roundish.



TITOVKA.

It is a favorite market apple in middle Russia and is found to endure the severest winters. At Grimsby, grown as a top graft, it is inclined to drop its fruit about the middle of August, and almost before fully colored. Probably a fine variety for export in cold storage, to succeed Duchess.

SECTION OF TITOVKA.

ORIGIN, Russia.

TREE, very hardy and productive.

FRUIT, large, $2\frac{3}{4}$x3 inches; roundish, often flattened at base and apex, somewhat irregular on sides; color, yellowish green, almost covered with stripes and shadings of bright red, and light green dots; cavity narrow, deep and irregular; stem about $\frac{3}{4}$ inch long, stout; basin, large, deep, plaited at bottom; calyx nearly closed, segments recurved.

FLESH, white; texture firm, moderately juicy; flavor brisk, tart, good.

SEASON, August 16 to 30.

QUALITY, dessert poor; cooking good.

VALUE, home market first-class.

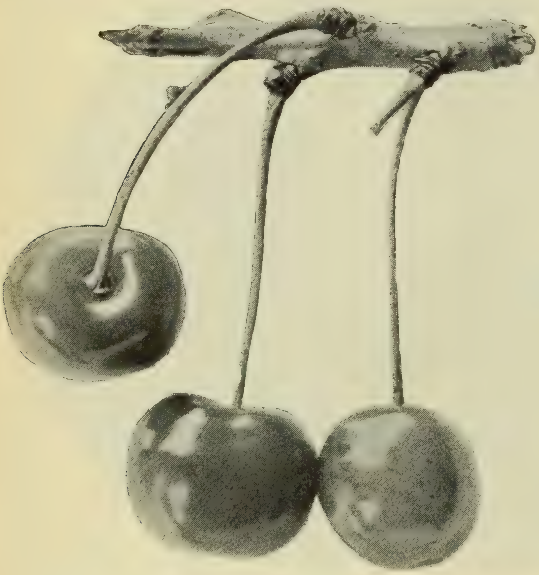
ADAPTABILITY, worthy of trial where Wealthy or Duchess succeeds. Very desirable for northern localities.

CHERRIES.

COE.

(*Coe's Transparent.*)

A good variety for the home garden, but altogether too tender to be popular for the Commercial orchard.



Coe's Transparent.

Origin, in Connecticut, with Curtis Coe, of Middleton.

Tree, healthy, fairly vigorous, with round spreading head, third rate in productiveness ; group, Heart.

Fruit, medium to large, about one inch long by one inch broad ; round and regular in form ; skin, thin, bright shiny amber, nearly covered with rich cornelian, marked with peculiar mottled blotches ; stalk one and a half to two inches long set in a medium wide cavity ; suture obscure.

Flesh, very pale yellowish tint; texture very soft and tender, juicy ; flavor very good if not left hanging too long.

Season, July 7th to 14th (1897).

Quality, good for desseit.

Value, second rate for home market fourth rate for distant market.

Adaptation, south of Lake Ontario.

EARLY RICHMOND.

(*Virginian May; Kentish Pie* (*Hogg*) ; *Hative* (*LeRoy.*)

This cherry appears to be of French origin, and George Lindley supposed that it had been brought into England from Flanders in the reign of Henry III.

Tree, slow grower, slender in branch, very hardy; very productive in proportion to its size.

Fruit, below medium, free from rot and not very subject to curculio ; form, almost round, though slightly flattened ; skin, uniformly of a bright clear red, becoming daıker as it matures ; stem slender, about one inch in length, often carrying the calyx inserted in a good sized cavity ; apex set in a small indentation.

Early Richmond.

Flesh, very tender in texture, yellowish with abundant uncolored juice ; flavor quite acid, pit small.

Season, June 20 to July 10, (1899.)

Quality, poor for dessert, but first-class for all culinary purposes.

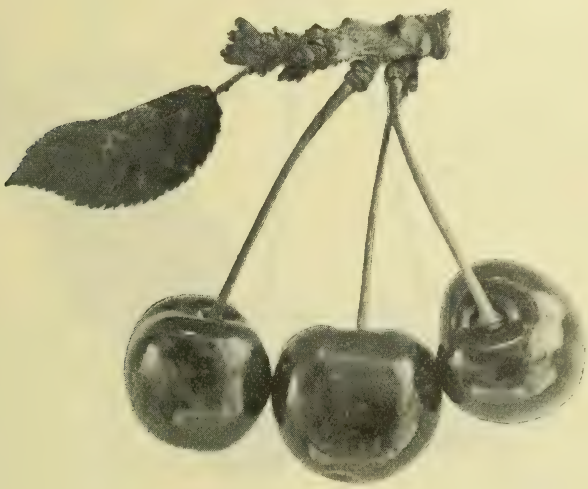
Value, very good for market.

Adaptation, succeeds at all the stations.

EARLY PURPLE.

(*Early Purple Guigne.*)

The earliest cherry is the Early Purple, a foreign variety known in France as the Early Purple Guigne. The tree is a vigorous, upright grower, and becomes quite productive as the tree acquires age. A tree at Grimsby, about thirty years planted, yielded in 1896, 144 quarts. They were harvested on the 11th of June, and sold in the wholesale market at an average of twelve cents per quart. This is the tree's best record, for usually the birds destroy the fruit before it matures, and if gathered as soon as colored red, it is little more than "skin and bones." The last few days of growth it fills out wonderfully, and becomes almost a so-called "black cherry." The branch which we photographed was taken from the tree above referred to and shows the habit of fruiting.



Early Purple.

Tree, upright, vigorous, healthy, productive when full grown.

Fruit, medium size, roundish heart-shaped ; skin dark red to purple ; stem two inches long in a shallow cavity ; suture obscure.

Flesh, red to purple ; texture tender, juicy ; flavor sweet and pleasant.

Season, June 13th to 25th, south of Lake Ontario.

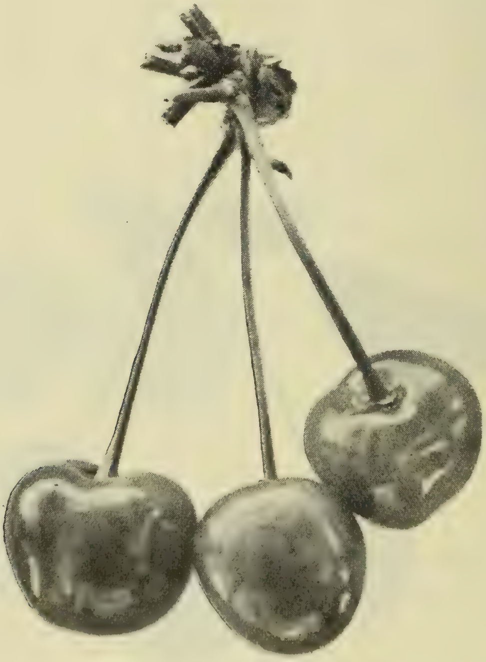
Quality, dessert, good.

Value, market, 2nd rate.

Adaptation. Grown at Grimsby for thirty years and quite hardy ; fairly hardy in Maine and Michigan ; recommended for trial north of Lake Ontario.

GOVERNOR WOOD.

This variety has proved itself a most satisfactory cherry for both dessert and market purposes. It is a very productive variety, and, though somewhat tender in flesh, is not nearly so subject to ravages by birds as Early Purple or Black Tartarian. Originated by Prof. Kirtland of Cleveland, Ohio, U.S.A.



GOVERNOR WOOD.

TREE, upright, spreading, healthy, vigorous and hardy wherever the peach succeeds.

FRUIT, medium to large, roundish-heartshaped ; skin, light, yellow, shaded with light to deep red ; stem 1½ to 1¾ inches long in a broad deep cavity ; suture, distinct on one side.

FLESH, yellowish, tender, juicy, sweet, aromatic and delicious.

SEASON, June 16th to June 25th.

QUALITY, dessert, 1st rate ; home market, very good ; distant market, good.

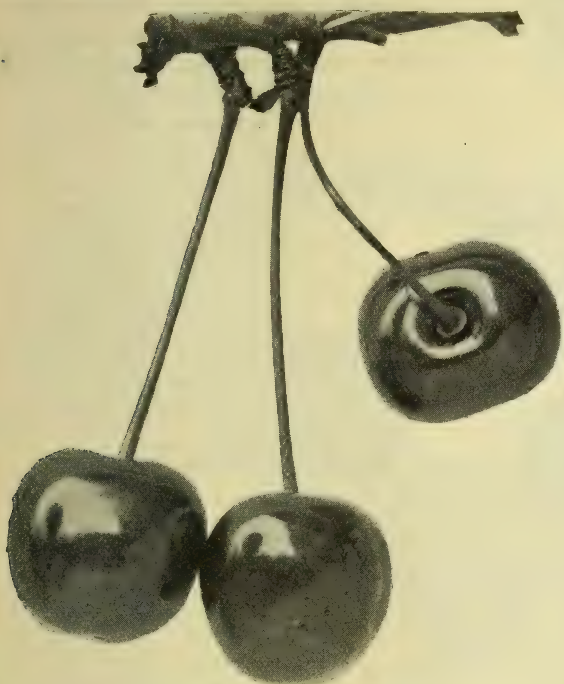
VALUE, market, 1st to 2nd rate.

ADAPTATION. Wherever the peach succeeds.

HORTENSE.

(*Reine Hortense.*)

One of the finest flavored of cooking cherries, and one which deserves the first place in the home garden. It is not as productive as the May Duke, but from its habit of fruiting singly is less subject to rot than that excellent variety.



HORTENSE.

ORIGIN, France, in 1832, by M. Larose, Neuilly ; first fruited in 1838.

TREE, of Duke habit, a vigorous and handsome grower and fairly productive ; Duke.

FRUIT, large to very large, roundish, elongated, sides slightly compressed ; skin, thin, light, shining red mottled with darker red, becoming richer in color the longer it hangs ; stock, slender, about two inches long.

FLESH, creamy yellow, netted, very tender, juicy ; flavor, slightly subacid, excellent.

SEASON, July 10th to 15th in 1897.

QUALITY, first-class for cooking.

VALUE, 1st to 2nd rate for market.

ADAPTATION, succeeds perfectly south of Lake Ontario.

KNIGHT.

(*Knight's Early Black.*)

A delicious early, black cherry, ripening about a week in advance of Black Tartarian. It is a regular and even bearer, the average yield being from seventy-five to 100 quarts per annum. The fruit is borne singly or, occasionally, in pairs, and therefore is not gathered as rapidly as those varieties which grow in clusters. It is one of the most valuable dessert cherries, but not as productive as the Tartarian.

ORIGIN, England, by T. A. Knight, in 1810, from Bigarreau crossed with May Duke.

TREE, healthy, fairly vigorous, with spreading head, second rate in productiveness ; Heart.

FRUIT, medium to large, obtuse, heart-shaped, uneven ; skin, dark red or purple, becoming almost black if allowed to hang ; stalk two inches long in a rather large cavity.

FLESH, dark red to purple ; texture, tender and juicy, but firmer than Tartarian; flavor, sweet, rich and delicious ; stone, small.

SEASON, July 1st to 6th (1897).

QUALITY, first-class for all purposes.

VALUE, for market, first-rate.

KNIGHT'S EARLY BLACK.

MONTMORENCY.

Of all the Kentish pie cherries this seems to us the most profitable. The tree is one of the most vigorous in its class, the fruit being large and abundant. This and the early Richmond cover the season very well, and are the two leading Kentish varieties for market. In France, this cherry has many synonyms, as, for example, Montmorency a longue queue, Petit-Gobet, etc.

MONTMORENCY.

ORIGIN, Montmorency valley in France in middle of 17th century.

TREE, hardy, healthy, fairly vigorous, very productive and an early bearer.

FRUIT, attached in ones and twos, $\frac{3}{4}$ long by $\frac{7}{8}$ inch broad, roundish, almost flattened at apex, skin bright shiny red, becoming darker at maturity, easily detached from the flesh ; stem, $1\frac{1}{2}$ inches long, in a rather large cavity.

FLESH, pinkish yellow, tender, very juicy, sprightly acid.

SEASON, July (1899).

QUALITY, very good for cooking.

VALUE, good for market.

ADAPTATION, general.

MAY DUKE.

(*Early Duke, Royal Hative.*)

The staple variety of cooking cherry in its season, both for home use and market. The great productiveness, health and vigor of the tree, the mild acid of the fruit ripening over a considerable season, all tend to make this a favorite variety in all cherry.growing districts. The fruit is rather tender for distant shipments.

ORIGIN, Médoc, a Province in France, from whence the name is said to be a corruption.

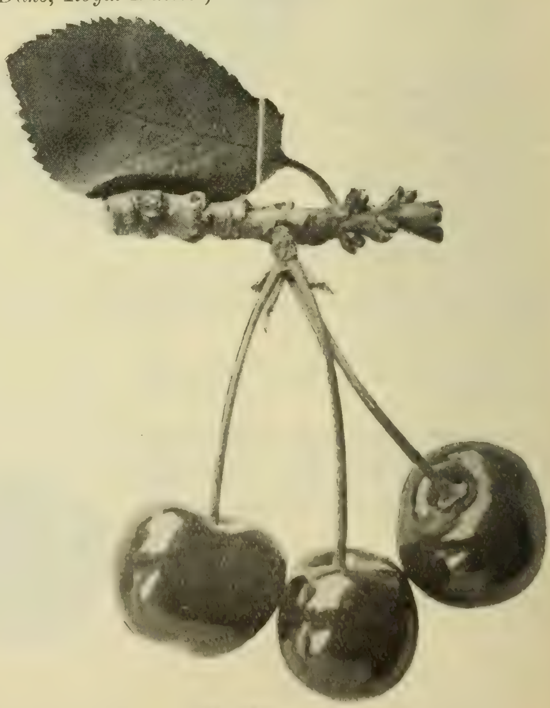
TREE, upright, of fastigiate head, a habit especially noticeable in young trees ; vigorous, hardy, and productive ; Duke.

FRUIT, roundish, obtuse heart-shaped, with traceable suture and distinct indentation to apex ; grows in clusters; skin , bright red turning darker at full maturity ; stalk $1\frac{1}{2}$ to 2 inches long ; stone small.

FLESH, red, tender, very juicy ; flavor, sub-acid and very good.

SEASON, June 12th to 20th (1897).

QUALITY, good for dessert ; first-class for cooking.



MAY DUKE.

NAPOLEON.

Napoleon Bigarreau, Royal Anne of California.

A valuable variety of foreign origin. Perhaps the most productive variety known, yielding fruit of the very largest size which is in good demand and, therefore, one of the most desirable varieties for the commercial orchard. It has one serious fault, namely, it is very subject to the rot, especially in wet seasons, and sometimes the whole crop of this variety is ruined by it.

NAPOLEON.

TREE, upright, spreading, vigorous, hardy on the south shore of Lake Ontario. Very productive.

FRUIT, very large, oblong heart shaped ; skin, yellow ground, light in shade, rich red cheek in the sun, sometimes mottled ; stem, $1\frac{1}{8}$ inches long ; suture plainly traceable.

FLESH, yellowish white, very firm, meaty, fairly juicy, good flavor, much esteemed for canning because it looks well in the jars and bears cooking well.

SEASON, July 8th to 16th.

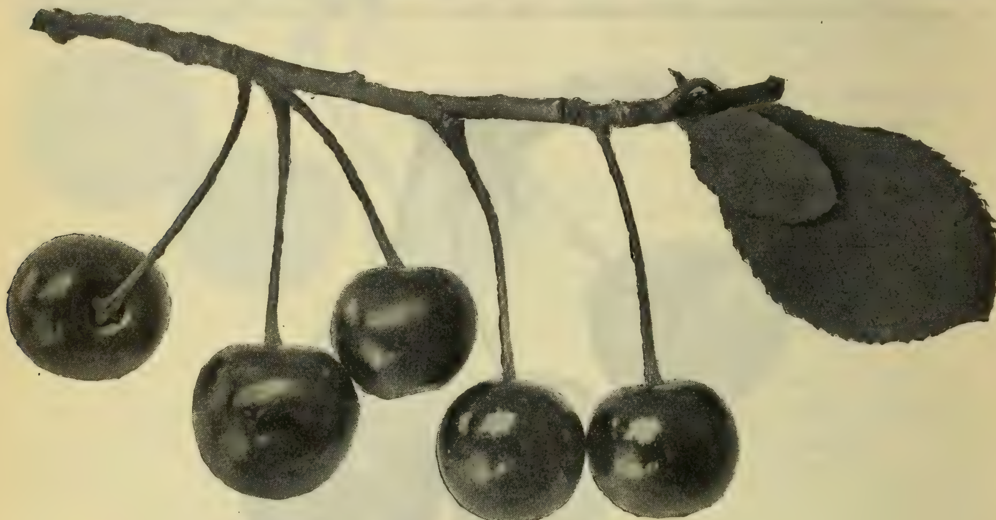
QUALITY, dessert medium ; market, very good to best.

ADAPTATION, the southern part of the Province of Ontario.

OSTHEIM.

(*Griotte d' Ostheim.*)

This cherry was distributed throughout the Province by the Ontario Fruit Growers' Association. The fruit is of fair size, productive enough to be profitable, and good for all purposes. Its hardiness should make it a special favorite in the colder sections to succeed the Montmorency.



OSTHEIM.

ORIGIN, South of Spain, brought to Germany early in the 18th Century, and cultivated near Ostheim, in Saxe-Weimar, whence its name.

TREE, third rate in vigor, almost a dwarf, first in hardiness, and second rate in productiveness ; Morello.

FRUIT, medium, about $\frac{9}{10}$ x $\frac{13}{16}$ of an inch in length and breadth. The variety must vary, since Dr. Hogg describes it as large, and LeRoy describes the stalk two inches long set in a pronounced cavity. Round, slightly depressed at the side ; color, very dark purple, almost black when ripe ; stalk, one and three-eighths inches, in ones and twos ; suture not traceable ; pit, small, cling.

FLESH, very dark purple, tender, juicy, almost sweet when ripe, agreeable.

SEASON, July 18th to 30th, or even longer, improving in flavor the longer it hangs.

QUALITY, poor for dessert ; fair for cooking.

VALUE, for market, third rate.

ADAPTATION, quite general ; found fruiting freely in St. Joseph's Island, Algoma, in 1898.

ROCKPORT.

A Bigarreau originated by Prof. Kirtland, of Cleveland, Ohio. Its season of ripening is about the same as Governor Wood, but it is a heavier bearer of fruit, about the same size and less highly colored. It would be profitable were it not so subject to rot, but nearly every year we have lost a large portion of the crop of this variety at Maplehurst from this cause. In the season of 1896 there was no rot, and a tree of this variety yielded about 100 quarts. Like the other Bigarreaus, it is too firm a cherry to be a favorite with the birds.

TREE, upright, ~~spreading,~~ fairly vigorous and very productive.

FRUIT, large, roundish, obtuse heart-shaped ; skin, amber, nearly covered with bright red.

FLESH, pale yellow ; texture, firm, juicy ; flavor, sweet and good.

QUALITY, dessert or cooking, good ; home market, second rate.

SEASON, June 26 to July 3.

ADAPTATION, southern Ontario.

CURRANTS.

NORTH STAR.

We have fruited this variety since 1896 at Grimsby, and at first we were inclined to condemn it as too small, but it has grown in favor each year, until, in 1899, it has surpassed most varieties in productiveness, in health and vigor of bush, and in keeping qualities. At date of writing, August 20th, the fruit still hangs as bright in appearance as it was a month ago. Possibly it would pay currant growers to hold the fruit for the latest market, for in the height of the currant season, the price is often very low.

ORIGIN, Minnesota.

PLANT, vigorous, healthy, very productive.

BUNCH, compact, three to four inches long, inclusive of about an inch of naked stem, which is convenient in gathering.

BERRY, round, $\frac{3}{8}$ inch in either diameter ; skin thin, bright red ; sub-acid.

QUALITY, cooking very good.

VALUE, second rate on account of size, but season and productiveness considered, it might be classed first rate.

SEASON, July 15 to September 1.

ADAPTATION, general.

NORTH STAR.

GRAPES.

MOYER.

For the amateur's garden this is a grape that should not be overlooked, for as a dessert grape it has now been tested about eighteen years and is rather growing in favor.

Moyer.

Origin, at Port Dalhousie, Ontario, by W. N. Read, from Delaware, fertilized with Miller's Burgundy about 1880.

Vine, fairly vigorous, healthy and not subject to mildew, hardy, not very productive.

Bunch, small, cylindrical in form, shouldered, not very compact, not uniform in size.

Berry, small, half to three-quarters of an inch in diameter, round, amber, with grayish bloom; skin, thin, tough; pulp, tender, juicy; flavor, rich, sweet and excellent.

Season, August 20.

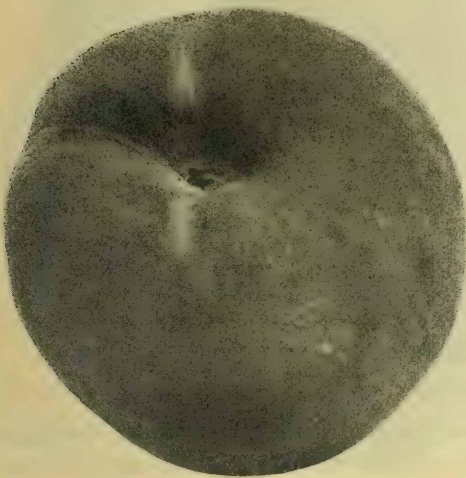
Quality, very good, but not equal to Delaware.

Value, very good for market.

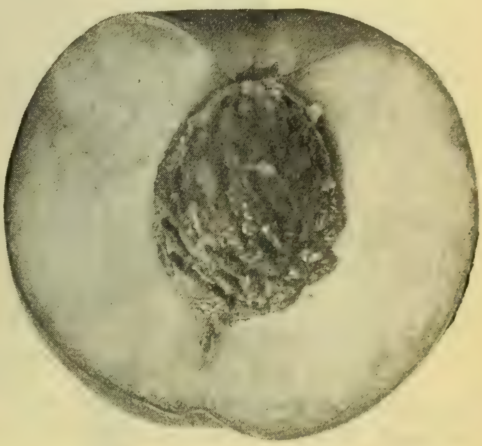
PEACHES.

ALEXANDER.

The earliest peach grown in the Niagara district and in Essex county. It is a clingstone of poor quality for dessert purposes and poor also for cooking, so that, in competition with yellow-fleshed varieties from southern orchards, it sells at a low price in our markets.



ALEXANDER.



SECTION OF ALEXANDER.

ORIGIN, chance seedling, Mount Pulaski, Ill., on farm of A. O. Alexander.

TREE, vigorous, hardy, productive.

FRUIT, medium, globular, sides unequal; color, greenish, suffused with dark and light red; suture broad; apex slighly sunken.

FLESH, greenish white, firm, juicy, half melting, clings to stone; flavor, sweet and fairly good.

SEASON, July 20 to 30, (1896.)

QUALITY, dessert poor; cooking poor.

VALUE, home market poor; distant market very poor.

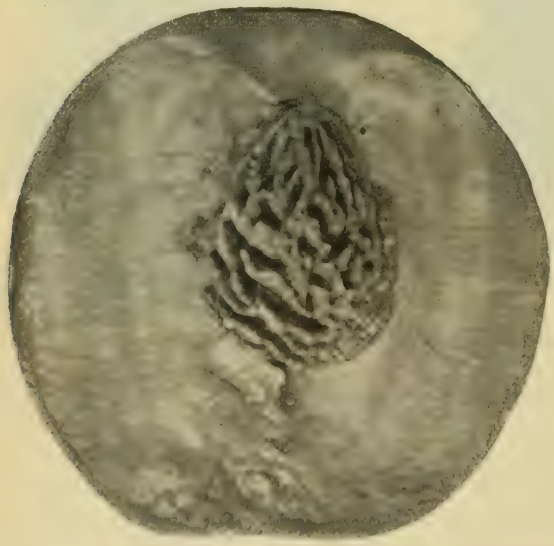
ADAPTATION, succeeds at Niagara and southwestern stations.

RIVERS.

When first introduced this peach was widely planted for market because of its fine size and early season, coming in between Alexander and Hale's Early. Its great fault is its delicate

EARLY RIVERS.

skin and tender flesh which shows the slightest bruise, so that the most careful handling is necessary. The fruit needs thinning for size and color, and then it can be sent only to the nearest markets.



SECTION OF EARLY RIVERS.

VALUE, second rate for market.

ADAPTATION, Niagara district and Essex county.

ORIGIN, by Thos. Rivers, of Sawbridgeworth, England.

TREE, very vigorous, fairly hardy and very productive.

FRUIT, medium to large, about $2\frac{1}{4}$ to $2\frac{1}{2}$ inches, roundish, often somewhat oblong and flattened on the sides, and more or less one-sided; skin, smooth, light green, almost white, delicately shaded with red; cavity, small and deep; apex, small in a narrow, deep depression; suture, deep and distinct: stone, half cling, inclined to split.

FLESH, creamy white, melting, juicy, fairly sweet and agreeable.

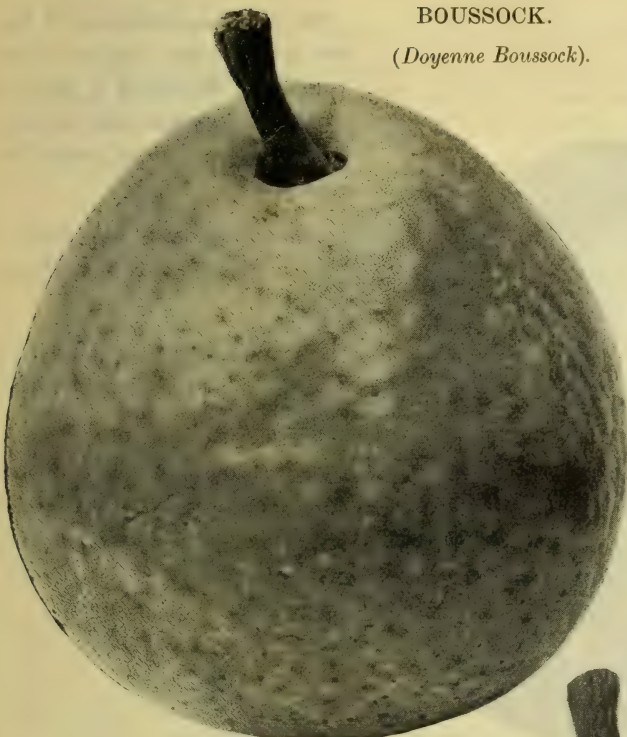
SEASON, August 10 to 20.

QUALITY, fair for dessert; fair for cooking.

PEARS.

BOUSSOCK.

(*Doyenne Boussock*).



DOYENNE BOUSSOCK.

Described by Downing as a profitable market sort, but our experience in Canada would lead us to give it a second place when compared with the Bartlett or the Anjou. The tree is a good grower and productive, and the fruit is uniformly large, but it is second class in quality unless eaten just at the proper stage of ripeness, and the tree is inclined to drop its fruit too soon.

ORIGIN, Belgium.

TREE, succeeds best as a standard ; vigorous, hardy and very productive.

FRUIT, large, about three inches in either diameter ; form, roundish, obovate ; skin, yellow, with dull red cheek, and numerous rough dots , stalk, fleshy, stout, one inch to one and one-quarter inche in length, in a round cavity ; calyx, open, in a shallow russeted depression.

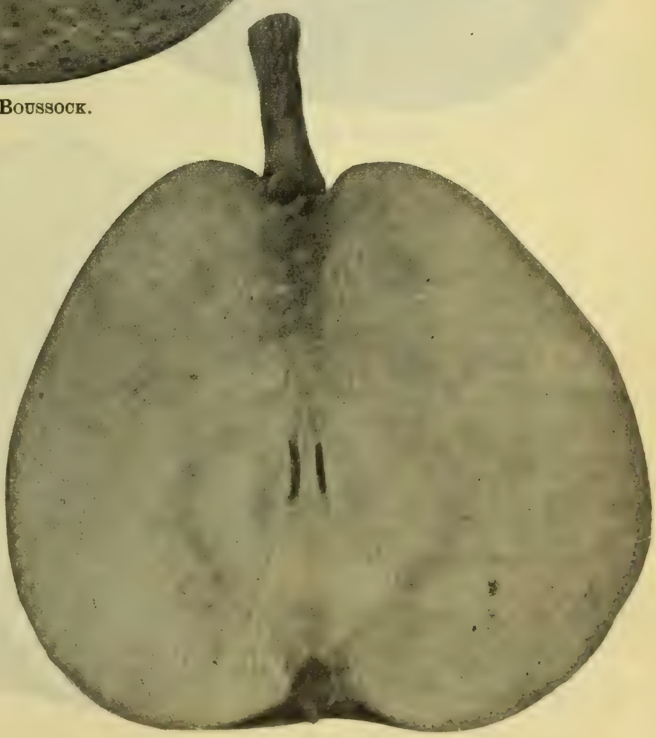
FLESH, white, tender, juicy, if gathered at the right season ; flavor, sweet and agreeable.

SEASON, September.

QUALITY, dessert, very good.

VALUE, near markets, very good.

ADAPTATION,



SECTION BOUSSOCK.

SHELDON.

SHELDON PEAR.

One of the most delicious of dessert pears, if eaten just at the proper time. Worthy of a place in every home garden, but not productive enough to be planted for market.

ORIGIN, accidental on farm of Norman Sheldon of Huron, Wayne Co., N. J.

TREE, vigorous, erect, not very productive, late coming into bearing.

FRUIT, above medium in size, roundish, obtuse obovate ; skin, yellowish-green, covered with thin light russet, brownish crimson in sun, russet dots ; stalk, short, stout, in a narrow cavity ; calyx nearly open, in a broad basin.

FLESH, creamy, buttery, juicy, sweet, aromatic.

SEASON, October.

Tested twenty years at Maplehurst.

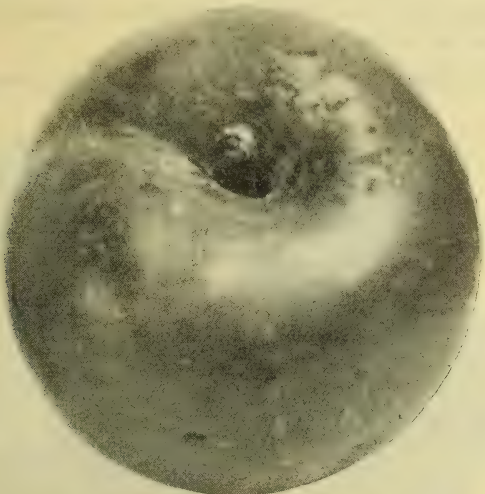
SECTION SHELDON.

PLUMS.

SIMON.

(*Prunus Simoni, Simonsi (Thomas), Simon's Plum.*)

A distinct species of stone fruit, having characteristics of both the peach and the plum. It has been tested in Ontario since 1888, and has not realized the expectations of planters who were led to expect in this fruit a substitute for the peach where the latter fruit was uncertain.



SIMON.

It has proven itself worthless in the commercial orchard, and valuable only as a curiosity.

ORIGIN, northeastern China, introduced to France by Eugene Simon and disseminated by Simon Bros. of Metz, Alsace. Fruited at Cornell University in 1886, and at St. Catharines, Ont., in 1887. It was placed on the plant distribution list by the Fruit Growers' Association in 1890.

SECTION OF SIMON.

TREE, upright, slender, lacking in vigor, not productive.

FRUIT, large, $1\frac{3}{4}$ x $2\frac{1}{4}$ inches in diameter ; form, round transversely and flattened longitudinally ; color, dark maroon, with a perceptible bloom ; stalk, half an inch long, stout, set in a deep cavity ; suture, distinct ; stone smooth, clings tightly to the flesh.

FLESH, orange color ; texture, tough and juicy ; flavor often bitterish, fairly agreeable.

SEASON, August 5 to 12.

QUALITY AND VALUE, very poor.

ADAPTATION. The peach sections.

RASPBERRIES.

CAROLINE.

A very productive variety, but of little use for market because too soft for shipping, and not in favor for home use because of its ordinary quality.

ORIGIN, at New Rochelle, N.Y., by S. P. Carpenter; supposed seedling of Brinckle's Orange.

CAROLINE.

FRUIT, medium size: form, round; color, pinkish yellow; seeds, small, close, easily parted from each other and from stalk; flesh, juicy, sweet, lacking in flavor.

SEASON, July 10 to 20, in southern parts.

QUALITY, only fair for all purposes.

VALUE, second rate for home use and market.

CUTHBERT.

(*Queen of the Market.*)

Previous to the introduction of the Cuthbert, many varieties of raspberries were grown for profit, such as Turner, Philadelphia, Highland Hardy, etc., but these have given place entirely and are heard of no longer. So prolific has this variety proved itself that acres have been planted by fruit growers throughout Ontario, and immense quantities of its fine fruit sent into our best markets until the prices have been brought down very low (1898). A favorite for canning factories.

CUTHBERT.

ORIGIN, chance seedling in the garden of Thomas Cuthbert, Riverdale, N.Y.

PLANT, vigorous, canes strong, often six feet high or more on rich sandy loam not too dry; sometimes branching; very productive; spines, short; stout, numerous; suckers almost too freely and young growth needs to be kept within bounds; species, R. strigosus.

FRUIT, large, $\frac{7}{8}$ x $\frac{5}{8}$ inch; color bright crimson; form, conical, obtuse at apex; seeds, small, compact, part easily from stalk when very ripe; flesh, firm, fairly juicy, sweet, agreeable.

SEASON, July 14 to August 1, in southern parts of the province.

QUALITY, first-class for cooking; good for dessert.

VALUE, first rate for market.

ADAPTATION, pretty general.

MARLBORO.

This raspberry has been coming gradually to the front ever since its introduction about the year 1880. The old Highland Hardy for a while disputed its place as an early market berry, but the superior size and beauty of the former soon caused the latter to give place entirely, until Marlboro and Cuthbert have become (1899) the two leading varieties of red raspberries to cover the season.

MARLBORO.

PLANT, fairly vigorous ; canes, short, stout, upright, without branches ; propagated by suckers ; fairly productive ; species, R. Strigosus.

BERRY, round, about three-quarters of an inch in either diameter ; color, light red ; seeds, close and firm ; flavor, mild, pleasant ; texture, rather seedy.

QUALITY, fairly good.

VALUE, market, first rate.

SEASON, July 1 to 15.

SHAFFER.

On its first introduction the Shaffer created much enthusiasm by reason of its thrift, productiveness and good quality. It is still considerably grown for canning purposes, but its color is not a favorite in the market.

SHAFFER.

ORIGIN, On farm of Mr. Shaffer, Wheatland, N.Y., in 1869; introduced by Chas. Green, Rochester, in 1881.

PLANT, very vigorous; canes grow six or seven feet high, if not pinched back; very productive; species, R. neglectus; propagates from tips.

FRUIT, large, $\frac{3}{4}$ x $\frac{7}{8}$; color, purple; form, roundish; grains, large, loose, easily separated from stalk; flesh, very juicy and tender; flavor, sweet, rich and very agreeable.

SEASON, July 12 to 24 in Niagara district.

QUALITY, first-class for cooking, good for dessert.

VALUE, first rate for home use, second rate for market.

MEETINGS OF THE BOARD OF CONTROL.

A meeting of the Board of Control was held at Toronto March 3rd, 1899.

The Secretary was instructed to send a collection of hardy stock of the various kinds of fruit to the Algoma Station, in charge of Mr. Charles Young, of Richard's Landing.

The Secretary read some correspondence from the Hon. John Dryden, regarding the use of the Pioneer Farm at Wabigoon for some experimental fruit-planting. The Board ordered that only the very hardiest kinds be sent for trial to Wabigoon ; a list of the same being first submitted to the Minister of Agriculture.

The Board also ordered that a copy of Bailey's Principles of Fruit Growing be sent to each experimenter, and that each one be advised to read the work carefully.

A meeting of the Board was also held at the Agricultural College, Guelph, on the 7th and 8th of Dec., 1899, when the report of Mr. A. M. Smith, of inspection of northern stations, was received and adopted.

The work done during the year by the Secretary on Fruits of Ontario and the accompanying photographs of fruits were carefully revised and adopted for publication.

The various reports from the experimenters were received and the Secretary was instructed to revise the same for publication ; and to certify to the payments of the amounts due.

The Secretary reported on the results of an experimental shipment of Canadian Rogers grapes to Manchester, Eng., made in November, 1899, under instruction from the Board, with the approval of the Hon. John Dryden, Minister of Agriculture, which was received and adopted. This report went to show that black and red Rogers grapes promise to be valuable for export to Great Britain.

APPLES.

Notes on Vigor and Habit, by W. H. Dempsey.

(*Bay of Quinte Station.*)

Downing's Maiden's Blush. Planted in 1896 ; growth in 1898 of 20 inches ; a well formed tree, foliage good.

Boiken. Planted in 1897. Made a good growth of 18 inches ; foliage heavy ; tree spreading, making a fine formed tree.

Shackleford. Planted in 1896. Has made a slender growth of 18 inches, and inclined to droop ; foliage medium.

Wallbridge. Planted in 1896. Made a good growth of 20 inches. Upright ; somewhat spreading. A handsome tree ; foliage good.

Peter. Planted 1897. Made a good growth of 20 inches. Upright, spreading, not inclined to throw out many shoots ; quite inclined to make a one-sided tree.

Western Beauty. Planted in 1896. Made a fair growth of 14 inches ; shoots heavy ; inclined to grow one sided ; foliage heavy.

Barry. Planted in 1896. Made a fair growth of 16 inches ; shoots medium, spreading ; foliage medium.

Sutton's Beauty. Planted 1896. Made a fair growth of 16 inches, making fine upright tree ; foliage good.

Starr. Planted in 1896. Made a growth of 14 inches. Has a tendency to throw out too many shoots ; foliage good. Trees were large, one year old when planted, but it would be impossible to pick them out from the rest at present.

Beauty of Bath. Planted 1896. Made a growth of 16 inches ; heavy, not many shoots, spreading, making a fair tree ; foliage good.

Walter Pease. Planted 1896. Made a good growth of 20 inches ; medium size ; shoots upright ; foliage good.

Dudley's Winter. Planted 1896. Made a growth of 20 inches, making one sided tree ; foliage heavy, good.

Aikin Red. Planted 1897. Made a slender growth of 16 inches ; trees almost drooping ; foliage good.

Lankford. Planted 1897. Made a slender growth of 20 inches ; almost drooping ; foliage medium.

Newtown Pippin. Planted in 1897. Made slender growth of 14 inches ; upright ; foliage medium.

Milding. Planted in 1897. Made a growth of 16 inches ; heavy, upright, making a fine tree ; foliage heavy, good.

Yates Red. Planted in 1897. Made a growth of 18 inches ; medium, fine-shaped tree ; foliage good.

Gano. Planted in 1898. Made a growth of 16 inches, making a fine tree.

Notes on New Varieties.

Arkansas Beauty. Top grafted in 1896. Made a fair growth ; foliage medium : bloomed May 14th. Fruit, 2½ by 2 inches, oblate, conical. Skin greenish yellow, nearly covered with dark red with a few splashes of a livelier red on side next the sun. Calyx closed, set in a narrow, moderately deep, corrugated basin. Stem ½ inch, slender, set in a narrow, moderately deep cavity. Flesh greenish white, tender, crisp, juicy, pleasant, sub-acid. Core, small. March and April.

Boiken Top grafted in 1895. Made a very good growth although fruiting for three years, and this season a heavy crop for the amount of wood ; bloomed May 14th. Fruit large, 3¼ by 2¾ inches, roundish, oblique. Skin yellowish white, with numerous small white dots, often flushed with red on side next the sun. Calyx closed, set in a broad corrugated basin. Stem, ¾ inch, set in a moderately deep cavity. Flesh white, crisp, brisk sub-acid. Kept good through March and fairly good till May.

Garden Gem. Top grafted in 1896. Made a medium growth, and fruited this year for the first ; bloomed May 13th. Fruit large, 3 by 2½ inches, oblate, conical. Skin waxen yellow, thinly covered with red on side next the sun, with streaks and splashes of darker red. Calyx closed, set in a deep uneven basin. Stem slender, 1¼ inch, set in a deep uneven cavity. Flesh white, crisp, tender, juicy, pleasant, sub-acid ; a good September dessert apple. Fairly productive.

Hamilton. Top grafted in 1896. Slow grower ; heavy wood, fruited this year for the first, and had all the apples it could possibly mature on it. Fruit 3 by 2¼ inches, oblate, conical, yellowish white. Calyx partially closed, set in a broad uneven basin. Stem, ½ inch, medium heavy, set in a narrow, deep russet cavity. Flesh white, a little coarse. September-October. Would not take well in market.

Jeffries. Top grafted in 1895. Has made a fair growth. Fruit large, 3 by 2½ inches, round, oblate. Skin yellow, shaded and splashed with red, with numerous white dots. Calyx closed, set in a deep basin. Stem, ½ inch, set in a deep cavity. Flesh white, with a few slight streaks of red ; tender, juicy, rich, mild, sub-acid. Good through September. One of the best of its season.

Lady Sweet. Top grafted in 1895 ; not a very strong grower. Fruit medium, 2¾ by 2½ inches, roundish, ovate. Skin, pale yellowish green, nearly covered with red, with darker streaks and splashes of red covered with a thin white bloom. Calyx small, closed, set in a narrow plaited basin. Stem, ½ inch, set in a shallow cavity. Flesh greenish white, tender, juicy, crisp, sprightly. March and April.

McLean. Top grafted in 1895. Made a good growth ; fruited this year for the first. Fruit medium, 2½ by 2¼ inches. Round, ovate whitish yellow, thinly covered with light red on sunny side with a few dark red blotches with streak, same as in Talman. Calyx closed, set in a shallow, broad basin. Stem ½ inch, slender, set in a moderately deep cavity. Core very small. Flesh white, tender, crisp, melting, juicy, very pleasant, mild, sub-acid. A good dessert apple. October.

Parlin's Beauty. Top grafted in 1896. Made a medium growth. Fruit 3 by 2½ inches, oblate, conical. Skin yellowish white, nearly covered with light red, splashed and striped with darker red. Calyx closed, set in a narrow plaited basin. Stem ¾ inch, heavy, set in a broad cavity. Flesh white, tender, melting, juicy, brisk, sub-acid. Good October dessert apple.

Starr. Top grafted in 1895. Has made a good, strong growth ; good, healthy foliage ; fruited this year for the first. Fruit roundish, oblate, 3½ by 2½ inches. Skin whitish yellow, a few grey dots, and some of the dots are red. Calyx closed, set in a broad corrugated basin. Stem medium, ¾ inch, set in a shallow cavity. Core small. Flesh white, tender, crisp, pleasant. sub-acid ; ripened very uneven through August. October. Abundance of fruit for the amount of wood.

Ulter's Red. Top grafted in 1895. Medium growth ; fruited last year ; bloomed May 14th ; set very light. Fruit 3 by 2½ inches, roundish, oblate. Skin yellowish white, with a few splashes of red on side next sun. Calyx open, set in an uneven broad basin. Stem short, sometimes a fleshy knot set in a shallow cavity. Flesh yellowish white, tender, sub-acid. September and October. Not desirable.

Rochelle. Top grafted in 1894. It has made a fine top, and fruited this year for the first time; it came into bloom May 13. Fruit large, 3¾ by 3 inches, roundish, ovate. Skin light straw, nearly covered with light red, streaked and splashed with dark red, with numerous large grey dots. Calyx closed, set in a broad uneven basin. Stem ½ inch, set in a narrow, deep cavity. Flesh whitish, coarse, sub-acid. Core small for so large an apple. Season, October. Fruit fell early in October, as is the case with nearly all large apples.

Winter Banana. Top grafted in 1896. Made a good upright growth; had a few imperfect specimens on last year; kept good in fruit-house until March; bloomed May 14th. Fruit large, 3 by 2¾ inches, round, ovate. Skin whitish yellow, flushed with red on side next the sun, with numerous white dots. Calyx partially open, set in a plaited basin. Stem 1 inch, heavy, set in a broad moderately deep cavity. Core large. Flesh white, c;isp, juicy, brisk, sub-acid.

Wolf River. Top grafted in 1894. Made a strong, vigorous growth; heavy foliage; had a few apples on last year and a good crop this year. Fruit large, 4¼ by 3½ inches, roundish, oblate. Skin greenish yellow, nearly covered with red, with splashes of darker red, numerous white dots. Calyx partly closed, set in a narrow basin. Stem ¾ inch, set in a deep russet cavity. Flesh white, coarse, tender, mild, sub-acid. September and October. Fruit clings to the tree better than Alexander, and will keep much longer, and is of the same value in the market, but a little more uneven in size.

Scions Grafted during the years 1895 and 1896.

Akins. Had one sample last year. Kept until April; this year has five. Fruit medium; attractive; bright red.

Arkansas Black. A fine looking apple of medium size; bright red, nearly covered with splashes and stripes of darker red. Three apples this year.

Barry. Yellowish white; dropped early, also ripened; not attractive in appearance.

Berton County. Bore heavily; resembles Ben Davis; medium.

Clayton. Another fall apple of fine appearance, of which we have so many; three samples; bright in color; good size.

Duffey's Seedling. Very attractive; bright red in color, and very productive.

Haskell's Sweet. One apple; does not look as if it would be any improvement on Talman, and of similar color.

Isabella. Three samples of good size, and of the appearance of Greening; ripened first of October.

Isham. A fine, bright colored apple, four samples.

Missouri Pippin, Very dull, dark red apple, small to medium in size.

Mammoth Black Twig. Not so large as the name would indicate, only medium; dark red on a greenish ground; very hard; no doubt would keep well.

Minkler. Medium to large. Quite productive from the amount of wood this year; every apple perfect; well covered with dark red.

Pioneer. (California Seedling). Large whitish yellow apple; good form.

Rome Beauty. Very handsome apple of good size; bright red in color.

Windsor Chief. Has borne two or three apples for two or three years; does not seem inclined to fruit heavily. Fruit is of good size and firm; dark red; kept well.

York Imperial. Fruit this year for the first; very attractive in appearance; bright red, and a good crop from the amount of wood.

Notes on Commercial Varieties, by A. E. Sherrington.

(*Lake Huron District*).

The winter of 1898-9 was a trying one to the fruit growers, not so much on account of the extreme cold but owing to the length of the cold spell with but little snow on the ground. Although we had it 30 degrees below zero there was comparatively little damage done to the fruit trees in this district. The loss at this station from this cause was four or five plum trees and about the same of young apple trees. Raspberries suffered somewhat, but not so much from the frost as from the snow breaking the canes down in the latter part of the winter, thereby lessening the yield of some of the varieties. There was not much planted at this station the past spring—two or three varieties of plums and about the same ot cherries, and a few currants. The stock is all doing well, with the exception of a few trees. None of the trees started well in the spring. The buds appeared weak, and were either injured by the winter frost or from fumigation. They were slow in starting The tent-caterpillar has been very numerous the past season, to such an extent in some localities that forest trees as well as orchards were entirely stripped of their foliage. The codling moth was very active, and spraying is still rapidly gaining in favor. The apple crop was much larger than was expected in the fore part of the season with a marked improvement in quality. The bearing orchard at this

station is about five acres, and the yield was about 300 bbls. of first-class winter fruit, the Ben Davis and A. G. Russet being especially fine. Pears were light, but of fair quality. Plums were a good crop. Cherries were fair, but the black-knot is getting in its work in this district. Small fruits were all good, owing much to the abundance of rain during the fruiting season.

This fertilizing experiment, I presume, has been dropped, as I did not receive any material this season to carry it on with, but there is a marked difference in quality as well as quantity of the fruit upon the plot that had been treated for the last two seasons. The following are some notes on a few of the leading varieties :

A. G. Russet. Tree spreading, fairly vigorous and hardy ; fruit medium to small ; quality fair ; average yield of fifty trees 20 years planted, 2 bbls.

Ben Davis. Tree upright, spreading, vigorous, hardy and productive ; fruit medium to large ; quality only fair ; yield 4 bbls. per tree ; 20 years planted.

Greening. Tree spreading, vigorous and fairly hardy ; not as productive as it might be, but profitable ; quality best ; season December to April : yield 2 bbls. per tree ; 20 years planted.

King. Of spreading habit, vigorous but not as hardy as it might be ; fruit large and of the best quality, but does not yield enough to make it a profitable variety ; season October to February ; yield 1 bbl. per tree.

Mann. Tree upright, spreading, vigorous and hardy, but not productive enough to make it profitable ; fruit medium to large ; of rather poor quality ; season February to May ; yield 1 bbl. per tree.

Spy. Tree upright, spreading, vigorous and hardy, rather long coming into bearing ; fruit large, quality best, but subject to spot ; season January to May ; yield 2 bbls per tree.

Oldenburg. A profitable fall variety of the best quality, bears young, hardy and prolific bearer : season August to September ; yield 2 bbls. per tree.

Ontario. This variety is of great promise ; it is vigorous and appears to be a hardy and an early bearer ; fruit large ; quality good ; season February to May.

Pewaukee. Tree very vigorous and hardy ; fruit large and of fair quality ; an abundant bearer but drops badly ; season January to March.

Notes on Hardy Apples, by G. C. Caston.

(*Lake Simcoe Station.*)

Everything in the experimental grounds here is growing well, and is apparently healthy. Though there is little to add to the report of last year. This is an off year for cherries, plums and pears here, so that there is nothing to report of these fruits except that they are all growing nicely and will probably fruit next year.

However, several new varieties of apples have fruited this year, a description of which is given below. The apple crop was very irregular in this district, while some orchards have fair crops of good quality, others were entirely barren. But I think that most cases of barren orchards could be traced to some preventable cause, such as damage the previous year or years from tent caterpillar and other insects, fungi, etc. Orchards that have been regularly and properly sprayed for the last few years have responded liberally by a good crop of apples of good quality which sold for very satisfactory prices.

Climatic Conditions. The winter of 1898-99 will long be remembered as a very severe one (especially by peach growers in southern Ontario), and it was quite expected that severe damage would be done to tender varieties here. The weather was very severe with extremely low temperature during part of February. For nearly a week the thermometer stood in the neighborhood of 20° below, and we had not the usual depth of snow which usually forms a safe protection to the roots of trees here. Yet everything in the tree line came through remarkably well. The only thing entirely killed out was a row of Dwarf Duchess pears. The apricots had a close call, but came through. The blackberries, Erie, Early King, were frozen dead down to the snow line. The weather was fine mostly during the blooming period, and the bees did good effective work among the apple blossoms.

There was abundance ot moisture during the summer up to the middle of July. From that to the first of September the weather was very dry and hot.

The season of 1899 may be summed up as follows, so far as the first crop is concerned : No plums or cherries, very few pears, strawberries medium, raspberries and blackberries good, early apples light, fall apples medium, winter apples variable, on the whole nearly an average crop, and of fair quality.

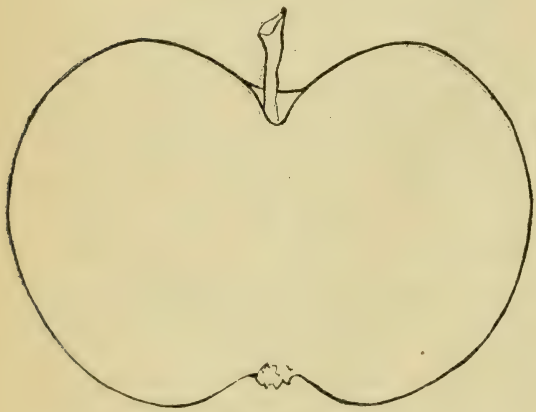
Insects and Fungi. The codling moth is very little in evidence this year. The tent caterpillar, however, has done great damage, and many orchards were completely stripped of foliage. People are slow to learn the benefits of spraying. Those who are doing it faithfully are getting their reward in comparative immunity from insect ravages and in a paying crop of marketable fruit, while those who do not have bare and barren orchards. The green and black aphis was not nearly so bad this year as in 1898, owing, perhaps, to the cool, moist weather of

early summer. To sum it up, those who intelligently and persistently fight insects and diseases with the means that science has placed within their reach will reap their reward.

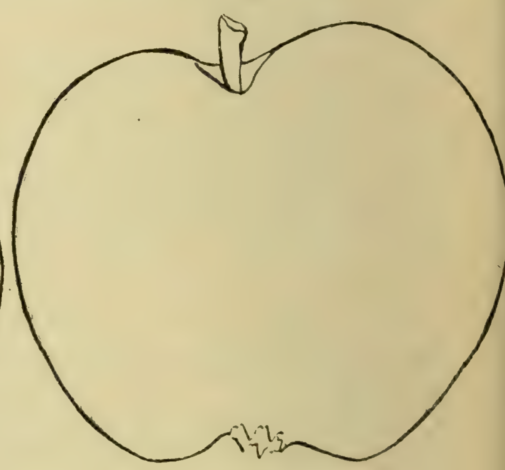
New Apples. Several varieties have fruited this year for the first time, most of them comparatively new varieties. These I have endeavored to describe as follows :

Boiken. Tree received in 1897 from Stone & Wellington. Tree healthy, thrifty grower, spreading, resembling Golden Russet in appearance. Evidently an early bearer, since a tree two years planted bore a dozen specimens of fruit. Fruit oblate, slightly oblique, 2⅞ in. in diameter ; skin greenish yellow, slightly tinged with red on one side ; stalk short, slender, set in a deep cavity ; calyx partly closed ; basin large, slightly corrugated ; flesh firm, white, juicy, sub-acid, probably a good cooker ; season, evidently a winter apple ; hangs well to the tree up to November.

Gano. Tree thrifty, upright, grower, also an early bearer. Tree four years planted bore about a peck of apples. Fruit, a little above medium ; fruit specimens from 2½ to 3 in. in diameter, roundish, conical ; skin green at first but entirely overspread with dark red when mature ; very much resembling the Baldwin ; flesh white, firm, with an agreeable flavor ; evidently a good keeper. I believe this to be one of the most promising of the new varieties and will take the place of the Baldwin, where that variety proves tender. However, time will tell as to its qualities, and I shall watch its future performance with great interest.

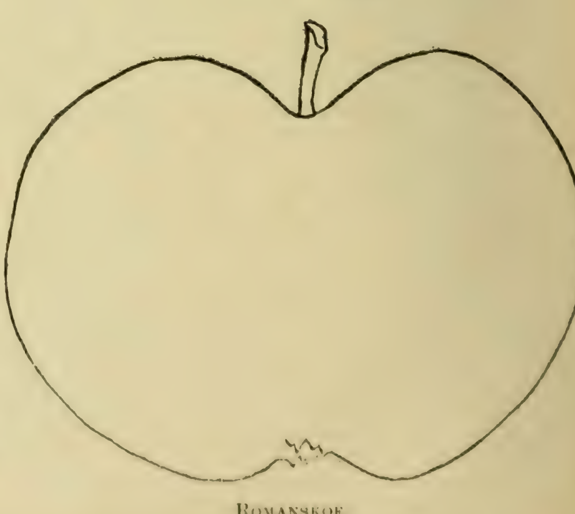


Boiken.



Gano.

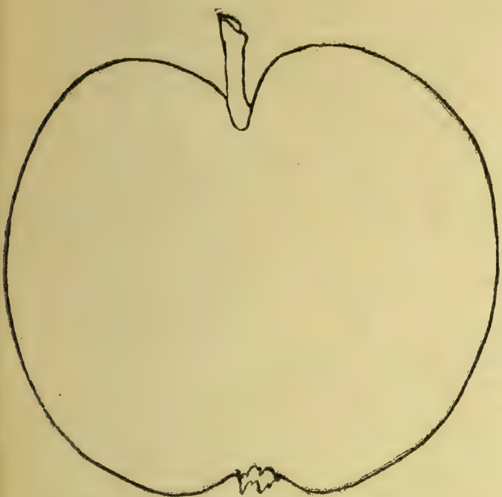
Romanskoe. This is a Russian apple planted in 1894, and bore a few specimens this year, and, like nearly all the Russians, is an autumn variety. Tree hardy, healthy, spreading, and needs little pruning. Fruit, large, 3 inches diameter ; oblate ; stalk, short, stout, set in a wide, moderately deep cavity ; calyx, partly closed basin, wide, shallow ; skin dark green, overspread and splashed with red ; flesh white, juicy, a little coarse, sub-acid ; a good cooker ; season, October-November ; a very good fall apple. It might rank fairly with the Colvert, but it bears earlier, and the tree being very hardy it ought to be well suited to northern sections I would like to see this variety tried in Algoma.



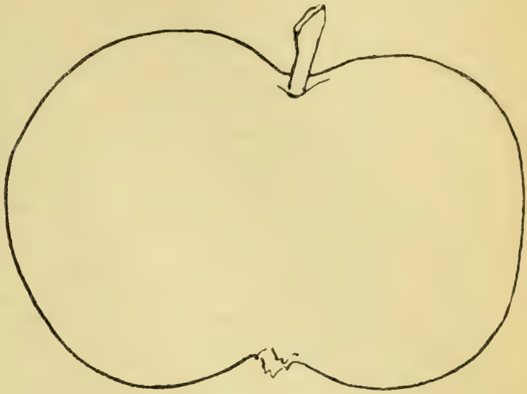
Romanskoe.

McMillan. This is another hardy fall apple grown from scions received from J. P. Cockburn of Gravenhurst, and said to have originated in Muskoka. Fruit a little above medium, 2½ inches in diameter ; skin yellow, overspread and splashed with red. Stalk short, set in a nar-

row cavity. Calyx small, closed in a shallow basin. Flesh white, a little coarse, mealy when ripe. Season, October. As we have already a plethora of fall apples, and this one does not come up to many of our tested varieties in quality, it would be no value here, but might on account of hardiness be useful in more northern sections.



McMillan.



Nod Head.

Nodhead. Grown from scions received from Stone & Wellington in 1895. Fruit oblate, flattened like Wagener ; size above medium ; skin yellow, overspread and streaked with dark red when ripe. Stalk short, set in a shallow cavity. Calyx closed in a shallow basin. Flesh white, a little coarse and dry, with a fair flavor. Season, October and November. As we have many better fall apples, this one is not recommended for planting.

Crabs. Some varieties of these bore a few specimens this year, and like the apples I cannot see that they are any improvement on the older varieties.

Florence. A very handsome crab, one inch in diameter ; skin bright red covered with a delicate bloom. Stalk medium. Calyx closed. Flesh white, of fair quality but quickly turns ; mealy when ripe. Season, August.

Whitney. A large crab, 1½ inches in diameter, conical ; skin green, striped with dark red. Stalk short. Calyx closed. Flesh white, sub-acid, good quality. Season, October. Tree fairly healthy, upright grower.

Telfer Sweet. This crab in the appearance of both tree and fruit resembles the Whitney. Tree an upright grower, needs to be well sprayed as the leaves are very susceptible to fungus. Fruit large, 1½ inches in diameter, conical, pointed. Skin green, splashed and shaded with red. Stalk long, slender in a narrow cavity. Calyx closed, small plaited basin. Flesh white, coarse, dry and mealy, slightly sweet. Season, October.

Paul's Imperial. Tree thrifty, healthy, spreading. Fruit medium, oblate, 1¼ inches in diameter. Skin bright glossy red, very handsome when ripe. Stalk long, slender, wide shallow cavity. Calyx closed. Flesh white, sub-acid, good quality. Season, October. Inclined to scab.

Picta Stricta. This is the only winter crab so far. It would evidently keep till January. Tree a medium grower, spreading habit. Fruit medium conical. Skin yellow with red cheek. Stalk medium. Calyx closed. Flesh white, fine grained, sub-acid, good quality. Season probably October to January. Inclined to scab, and needs to be well sprayed.

Quaker Beauty. A large, handsome crab somewhat resembling Montreal Beauty, but larger. Tree healthy and thrifty in wood and foliage, spreading habit. Fruit large for its class. Skin golden yellow, with bright red cheek. Flesh white, firm, with a slightly astringent taste. Season, apparently October to December.

Notes on Varieties. There are some varieties of apples that are a little tender, and it is well to give a few notes as to my experience with some of these.

Sweet Bough. A tender variety. The tree will not stand this climate, and may be regarded as a failure.

Mann. This is one of the finest and most valuable winter varieties introduced here. It is a valuable variety for export on account of its grand keeping qualities. It has the fault of dropping, however, and should be picked earlier than Spy, or Ben Davis. The tree is only half hardy however. Several of mine have died, and I would strongly recommend top-grafting it on hardy stock. For myself I would not in future attempt to grow it in any other way.

Ben Davis. Though extensively grown here and so far holding an important place in the list of export apples, it may be said to be half hardy. So far it is one of the most profitable winter apples, but not a long lived tree. It is subject to sun scald, and many of the trees show signs of early decay. It gives grand results when top-grafted.

Here is a list of valuable apples that ought to be grown in this section by top-grafting on hardy stock, and in no other way, and that they can be grown to perfection and with profit in this way has been amply proved by experience: King, Spy, Baldwin, Greening, Mann, Ben Davis. This is a fine list and if a grower confined himself to this list alone he would, to use a modern phrase, "be in it."

There is a good list of fall apples that grow to great perfection here. but the question arises should we advise the planting of fall apples at all, have we not too many already. If I were advising a planter (and I am often asked to advise in this matter) I would say go slow in planting fall apples. Will they pay to export? Judging from this year, no. They just reach the British markets in time to come into competition with the home grown apples, and seldom return any profit. Therefore, unless sure that the home market will absorb them I would say go slow on fall varieties.

The chief value of Russian apples will be in their hardiness and adaptabily to the northern sections of the Province, where only the very hardy trees will grow. So far as I know there is not a first-class winter apple among them that would at all compare with King, Spy, Baldwin, etc. They seem to be nearly all early kinds, and have we not already a plethora of them? However they would make excellent stock for top working other varieties on.

I fruited an apple this year which was sent me some years ago from Ottawa, and labelled "Blushed Colville." I did not consider it worth describing as it is absolutely worthless. The tree however is a fine healthy, thrifty grower, and may do for top working.

The McIntosh Red is very popular as a dessert apple, superior in this respect to its parent the Snow. On young trees bearing their first crops, the fruit is large, handsome, and covered with purplish bloom, but as the trees get larger the fruit is smaller and inclined to scab, and needs most thorough spraying. The tree is hardy and a thrifty grower, and if this variety can be grown clean and of a good size, it ought to make its mark as an export apple on account of its high quality as a dessert fruit. It is a better keeper than the Snow.

Top-grafting. An instance of the influence of the stock upon the variety grafted upon it was noticed year. Alexanders top worked on Tallman Sweets were much later than where grown on their own trunks, and some were still clinging tightly to the tree at the time the Northern Spys were picked. There is a point here that has been not d by Prof. Bailey, and one well worthy of extended experiment and study. viz., the possibility of improving the keeping qualities of many varieties in this way, and also improving the productive qualities, by grafting on a hardy productive stock and further increasing this quality by using scions of the most productive trees of the variety you wish to propagate, and still further to take scions from the most productive parts of a tree, for it is well known that often one side of a tree is more productive than the other. Some experimental work along this line may lead to important, interesting, and valuable results.

Effects of Potash. Frequent complaints are heard during dry seasons of trees dropping their fruit. I have found by experiment that trees that had plenty of potash supplied to them in the form of ashes, or otherwise, were almost entirely free from this trouble, while those where no potash was applied dropped their frnit badly. Further experiments along this line will be made, and will no doubt prove interesting if not valuable.

APRICOTS.

Notes on Varieties, by M. Burrell.

(Niagara Station.)

Three of the apricot trees were winter killed, the remaining trees having made a thrifty growth. Two nectarines, Early Violet and Boston, also succumbed, and two mulberries, Downing and New American, shared a similar fate.

BLACKBERRIES.

Notes on Varieties, by A. W. Peart.

(Burlington Station.)

This plant was injured both by the continuous frost of February and the intense summer drouth. They were therefore a light crop. All varieties suffered more or less from the frost,

to that in relation to *hardiness* of varieties, this report is based on their record for a number of years and not this year alone, as it was an abnormal one and not a type of average conditions. All varieties were injured the most on low ground, and the least on high dry soils.

Agawam. Plant upright, spreading, hardy, very vigorous and very productive. Berry oblong, round ; medium size, sweet. Season, medium to late. A profitable variety.

Ancient Briton. Plant upright, spreading, hardy, fairly vigorous and moderately productive. Berry oblong, conical ; medium ; flavor good. Season, medium.

Child's Tree. Plant upright, spreading, hardy, vigorous, moderately productive. Berry ovate, round ; small to medium ; sweet ; sprightly. Season, medium.

Dorchester. Plant upright, spreading, very vigorous, hardy and a moderate bearer. Fruit large, oblong, round, sweet. Season, medium.

Early Cluster. (Probably misnamed.) Plant upright, vigorous and hardy, moderately productive. Fruit medium, oblong, round, good in flavor. Season, medium to late.

Early Harvest. Plant upright, moderately vigorous, hardy, productive. Fruit medium to large, oblong, conical, of fair flavor. Season, early. A good commercial variety.

Early King. Plant upright, spreading, medium vigor, hardy and productive. Fruit small to medium, roundish, oblong, good quality. Season, early to medium. A very promising variety.

Eldorado. Plant upright, spreading, vigorous, hardy, moderately productive. Fruit medium, oblong, conical ; quality good. Season, medium.

Erie. Plant upright, spreading, vigorous, hardy and productive. Fruit medium, conical, round, good in quality. Season, medium. A good market variety.

Gainor. Plant upright, vigorous, hardy and productive. Fruit large, roundish, oblong ; quality fine. Season, medium. A very promising variety.

Kittatinny. Plant upright, very strong and vigorous, productive, and thus far hardy here. Fruit very large, ovate, conical, rich, juicy and sweet. Withstands the drought better than many varieties. Season, late. Profitable for either garden or market.

Lovett's Best. Plant upright, moderate vigor, hardy and fairly productive. Fruit roundish, oblong, small of fair quality. Season, late.

Maxwell. Plant weak and spreading, somewhat tender, not productive. Fruit large to very large, roundish, oblong, of good quality. Season, medium. Not a promising variety.

Minnewaski. Plant upright, spreading, vigorous, hardy, moderately productive. Fruit oblong, round, medium ; quality good. Season, medium.

Ohmer. Plant upright, spreading, moderately vigorous, hardy, fairly productive. Fruit very large, oblong, conical ; flavor pleasant, sprightly. Season, medium.

Snyder. Plant upright, moderately vigorous, hardy and very productive. Fruit oblong, oval, medium, of good quality. Season, early to medium. The drought acts very severely upon this variety unless the ground is well cultivated. One of the best market varieties.

Stone's Hardy. Plant upright, spreading, moderate vigor, productive and very hardy. Fruit, oblong, conical, medium, of good quality. Season, medium. A promising variety.

Taylor Plant upright, vigorous, hardy, and moderately productive. Fruit oblong, conical, medium, of fine quality. Season, medium.

Wachusetts. Plant upright, vigorous, hardy, moderately productive ; almost thornless. Fruit small to medium, roundish oblong ; quality fine and sweet. Season, medium.

Western Triumph. Plant upright, very strong and vigorous, and very productive ; very thorny. Fruit medium, oblong, round, of good quality. Season, medium. One of the best market varieties.

Wilson's Early. Plant upright, rather weak, hardy, but not very productive. Fruit large, oblong, round , quality good. Season, early to medium.

Wilson Junior. Plant spreading, trailing on the ground ; some canes measure eleven feet ; propagates partly by tips and partly by suckers ; hardy but not productive. Fruit medium, oblong, conical, sweet. Season, medium.

CHERRIES.

NOTES ON VARIETIES, BY L. WOOLVERTON.

(*Grimsby Station.*)

The summer of 1899 has been exceptionally favorable to the cherry. The continued dry weather in May and June has prevented the germination of the cherry rot, so that varieties like Napoleon and Yellow Spanish, which usually spoil in a wholesale way from this fungus, have this year ripened perfectly ; and have had such unusual firmness of texture that they would keep a couple of days if necessary, and carry to a more distant market than usual in good condition.

The crop also set unusually well, and was very little subject to blasting, so that each tree yielded wonderfully, giving quite a bit of encouragement to cherry growers.

Another favorable condition was the healthy foliage, being almost free of aphis, which has been a curse of late years. No doubt the increase of the natural enemy of this insect, the ladybug, has been the secret friend, eating up this pest.

Early Purple was the first variety in our collection to ripen. Some of the trees were very sparsely loaded, but one tree, four years planted, was literally loaded, carrying about six quarts of fruit. The usual fault of this cherry, that it is badly eaten up by birds, was not so noticeable this year, and most of the fruit hung well until quite black. The first ripe fruit was about June 8th, and the last about the 20 h. When well ripened the Early Purple is very dark in color and a delicious cherry, but in our experience it cannot be relied upon to carry to ripeness even a fair crop of cherries. It is doubtful if it would be of much value to plant as a market variety.

Governor Wood followed closely upon Early Purple. The first ripe cherry was about the 14th of June, but the main crop was gathered about the 20th. The fruit was finely colored, firm, free from rot, and the yield exceptionally good. The fruit continued to hang until about the end of the month improving all the time in flavor. This and all the other light colored oxheart or Bigarreau cherries sell at a lower price than the blackheart cherries. This cherry deserves more money than the others, because of its superior flavor. Yield of forty-year-old tree about 75 quarts.

Rockport Bigarreau ripened unusually well this season. This is the most subject to rot of any variety in our collection, other years, but during 1899 we have hardly lost a single cherry with this fungus. Every averted shower that threatened ruin to other garden truck, was salvation to this cherry, and we gathered a fine crop off a forty-year-old tree. The coloring and flavor has been good, though not nearly equal in quality to Governor Wood. The season is about the same as Wood. but the flesh is much firmer, being a Bigarreau. We do not recommend this variety for the commercial orchard.

Coe's Transparent. Gathered June 21; season, June 18th to 30th, 1899; yield of tree forty years planted, 34 qts. The quality is fine, and firm enough to ship when picked a little on the green side. No rot and no curculio—so that the packing was a pleasure, for every cherry counted. Usually, however, this cherry is too tender for distant shipment.

Cleveland. Ready for gathering about July 1st. The first cherry ripe enough for eating was ready about June 15, along with Governor Wood. but it hangs longer, is of firmer flesh, midway in this respect between the Hearts and the Bigarreaus It seems to have a very long season. It takes on a wonderfully handsome red cheek. and its flavor excels almost any cherry in my collection, possessing a delightful aroma. A four-year-old tree yielded about four quarts.

May Duke. Every year this cherry gains in favor. The first ripe cherries were ready about the 18th of June, and the last about July 5th, thus covering a good long season. Yield of a four-year-old tree, about eight quarts; the tree had a very upright habit, and bears fruit closely along the whole length of the branches, which has a very peculiar habit of uneven ripening, sometimes a single branch being quite green when the rest of the tree is fit for gathering. Gathered first for pies on June 23rd, a little in advance of Early Purple.

Rockport gave a magnificent yield, but this was the first time it has done so in years, owing to rot, which usually takes more than half the crop. The trees were carefully sprayed with Bordeaux mixture the early part of the season, about three applications, viz.: 1st, before blossom opened, once after the bloom fell, and once about two weeks later. The dry months of May and June, however, had more to do with the freedom from rot than any other agency, and had the season been wet no doubt we could not have gathered one half the crop.

Knight's Early Black. Season 1899 from 20th to 30th. Yield from a tree 35 years planted was 132 quarts. The fruit is always born in scattered ones and twos, and not as subject to rot as some other varieties which grow in close clusters. The yield this year was heavy; the stalks hold a little more firmly to the tree than Tartarian, making it a little harder to gather.

Yellow Spanish. Gathered July 3rd to 4th in 1899 Yield, though usually very subject to rot and blast, so that the yield is very slim, this season there was none of either, and a full crop was harvested. The color and size was unusual also, so that the little baskets full looked like so many baskets of little apples. The best selling cherries in 1899 were Tartarian, Napoleon and Spanish.

Royal Duke and Late Duke are two magnificent varieties of pie cherries. The Royal Duke ripened from 1 to 12 July; yield of four-year-old tree, about ten quarts. There were a good many blasted cherries, and the flavor was rather ordinary compared with Late Duke. Late Duke ripened about 28th June and continued about two weeks; it colored beautifully, and the cherries hung closely along the branches, and the picking was easy and rapid. The yield was about 12 quarts; the fruit is clean, bright and of fine flavor. The fruit of both these varieties is larger and later than May Duke, but a little inferior in flavor.

Choisy bore about two quarts at four years of age. The fruit was scattered on the tree, and the variety appears to be too unproductive for profit. The cherry grew to a good size this season, and showed no rot or curculio. The flavor was sweet, rich and delicious; among the best for dessert purposes. Ripe from 28th June to 10th July.

Hortense on four year old tree, exceptionally fine. Yield about six quarts of largest size fruit. The very finest for cooking cherries, and very good for dessert. Would recommend it for the home garden rather than for market, as the flesh is very tender. Fruit clear of rot or curculio. Ripe June 28 to July 12.

Ohio Beauty. A medium sized cherry, of bright red color, and fine flavor for dessert purposes. Too small for profit. Ripe June 28th to July 12th.

Orel 28 resembles Early Richmond in appearance of fruit and in tree. The fruit ripens a few days later, a stem even shorter, and cherry if anything smaller. Ripe June 25th to July 5th.

Montmorency Ordinaire. Four year old tree produced about 1 quart. Ripe about 1st July to 15th. Poor in productiveness in 1899. Cherry smaller than large Montmorency. and every way inferior.

Olivet. Season, June 28th to July 12th, Yield of four year old tree about two quarts. Rather soft for shipping, but otherwise one of finest of Kentish cherries. The fruit is the largest of its class, dark rich red in color, very mild acid flavor, and deserves a place in every private garden.

Elkhorn. Season, July 9th to 10th. Most productive ; this year the fruit hung over whole tree in great heavy clusters. A Bigarreau, and inferior in flavor to the Hearts, but a good seller because of its dark, almost black color. Flavor slightly bitterish. Not much rot in 1899. but some years very subject to it and it often takes the whole crop.

Elton. Ripe June 22 to July 5th. Those left hanging on 5th July very tender and delicious ; flavor peculiar to itself. On whole this cherry was below its proper size in 1899.

Belle Magnifique appears to be a most desirable late variety. In 1899 it did not begin ripening until July 12, by which time Richmonds and Morellos were both harvested. A fine cooking cherry. The tree appeared to be fairly productive and of good quality for cooking. A Duke.

Eugenie is a most excellent Duke cherry. The tree grew vigorous and upright, and was heavily loaded A tree 4 years planted yielded about six quarts. The fruit began ripening about the 20th of June and hung until about the 15th of July, becoming almost black toward the last. The resemblance between this and the May Duke is very strong.

Notes on Varieties, by M. Burrell.

(Niagara Station.)

The extremely dry weather of June was unusually favorable for the harvesting of the cherry crop. Not nearly as much rot obtained as during the previous season. Our Early Richmond orchard of some 130 trees turned out over 350 baskets of excellent quality, many of the trees, now 10 years old, producing four, and even five, baskets to the tree. Montmorency also yielded well, the fruit of this variety being of a large and firm character. May Duke—Six of these trees, 11 years old, yielded 32 baskets of exceptionally fine sample. The cherry is large, of beautiful color and with a fine flavor of sub-acid character. The one tree that was left unsprayed had a slight amount of rot, the others being entirely free. This is a bad variety to rot in a wet season, and needs careful and systematic spraying. Napoleon Bigarreau, Gov. Wood and Knight's Early Black did well amongst the sweet varieties. The black aphis was not so bad as last year, but this insect, the worst enemy of the grower of sweet cherries, must be fought vigorously and very early in the season. One pound of whale oil soap to seven gallons of water, mixed hot, or strong tobacco water, one pound to three gallons, whith two ounces of whale oil soap added, were amongst the most satisfactory remedies.

CURRANTS.

Notes on Varieties, by A. W. Peart.

(*Burlington Station*).

Currants were a heavy crop of splendid quality. The fruit was unusually large, and the bushes are in a healthy, thrifty condition. Prices, too, were high enough to leave a fair profit, which has not been the case with currants before for several years. The currant worm was destroved by spraying with hellebore. There was no mildew on the bushes.

Belle de St. Giles.—Bush, upright, spreading, healthy, a moderate grower ; not very productive. Berry, red, very large, of fine flavor. Season, medium.

Black Victoria.—Bush, upright, medium vigor, only moderately productive. Berry, black, large and sweet. Season, medium to late,

Brayley's Seedling.—Bush, upright, spreading, vigorous and productive. Berry, red, medium size and very acid. Season, medium.

Champion.—Bush, upright, spreading, very strong and vigorous, and moderately productive.

Berry, black, very large and somewhat acid in flavor. Season, one of the latest of the black varieties.

Cherry.—Bush, strong, vigorous and very productive. Berry, dark red, large to very large, and acid in flavor. Season, early to medium. One of the most profitable currants.

Collin's Prolific.—Bush, upright, a very rank, strong grower, but so far not very productive. Berry, very large, black and acid flavor. Season, late.

Fay's Prolific.—Bush, upright, spreading, a moderate grower and productive. Berry, red, large to very large and less acid than the Cherry. A profitable market variety. Season, medium.

Lee's Prolific.—Bush, upright, spreading, moderately strong and very productive. Berry, black, very large, acid. Season, medium to late. A good commercial currant.

Naples.—Bush, upright, strong and vigorous, and very productive, Berry, black, large and acid. Season, medium to late. One of the best market varieties.

New Victoria.—Bush, upright, spreading, a vigorous grower, but not very productive. Berry, red, medium, of good flavor. Season, early to medium.

North Star.—Bush, upright, spreading, moderately vigorous and not very productive. Berry, red, large, sprightly and good flavor. Season, medium.

Pomona.—Bush, upright, spreading, moderately strong. Berry, red, large, of good flavor. Season, medium.

Raby Castle.—Bush, upright, strong, vigorous and very productive. Berry, red, medium and acid. Season, medium. A good commercial variety.

Red Cross.—Bush, upright, spreading, medium vigor and moderately productive. Berry, medium, flavor good. Season, medium.

Red Dutch.—Bush, upright, strong, healthy and productive. Berry, small to medium, flavor good. Season, early to medium.

Red Victoria.—Bush, upright, strong, vigorous and very productive ; bunch very long and large. Berry, bright red, medium to large, and fine quality. Season, medium. A good commercial currant.

Saunders.—Bush, upright, strong and vigorous, but not very productive. Berry, black, arge, sub-acid in flavor. Season, medium to late.

Versailles.—Bush, upright, spreading, moderately vigorous and fairly productive ; bunch long. Berry, red, medium, not so acid as the Cherry. Season, early to medium.

White Grape.—Bush, upright, spreading, of medium vigor, productive. Berry, white, very large and fair in quality, somewhat acid. Season, medium.

White Imperial.—Bush, upright, spreading, medium vigor and moderately productive. Berry, white, large, of fine quality. Season, medium.

Wilder.—Bush, upright, vigorous and very productive. Berry, red, large, of good quality. Season, medium. A most promising variety.

GOOSEBERRIES.

Notes on Varieties, by Stanley Spillett.

(*Gooseberry Sub-station.*)

Downing, *Pearl*, *Champion*, *Success*, *Oregon*, *Jumbo* and *Red Jacket* were entirely free from mildew this season, but at least one-third of the crop fell off prematurely. Every fallen berry contained a grub.

Pearl and *Champion* gave the largest crop. Pearl averaged six quarts to the bush with two quarts on the ground. Champion gave about the same, but being picked green did not have so many fallen berries.

The berries of Champion are fully grown two weeks' earlier than any other variety in my collection so get picked while green. Two years ago this variety midewed badly, but never since or before.

Success is in all respects a Downing.

Red Jacket and *Oregon Jumbo* are very much alike in vigor, foliage, color and shape of berry, The berry of Oregon Jumbo is a little larger than those of Red Jacket. When picked just as they commence to turn red they look well in the basket.

Of the pure foreign varieties Green Chisel is the most vigorous making five to six inches of wood. The berry is green and of first class flavor.

Ingram's Ocean, *London*, *Lancolet*, *Red Champagne Whinhams Industry* don't grow enough wood, but the fruit is large and excellent in flavor.

Among the acclimatised varieties and seedlings from them, Whitesmith is hard to beat. This variety gave a fine crop of large yellow berries and made a growth of twelve inches of new wood (not suckers), but mildewed badly, though the fruit did not rot as formerly but ripened up perfectly.

Queen Chautauqua and *Large Golden Prolific* are very much alike in every respect. Yielding a fine crop of large yellow berries and made from eight to ten inches of new wood.

Crosby's Seedling gave three quarts per bush of very large red berries, and made one foot of new wood and a liberal supply of it.

Lancashire Lad gave one quart of luscious red berries, but is a poor grower.

Dominion gave two quarts per bush of yellow berries, resembling Whitesmith, and made from ten to twelve inches of new wood and plenty of it. Berries mildewed badly.

Columbus gave four quarts of large yellow berries which mildewed less than any other of the large varieties, except Ontario, and made abundance of new wood.

Ontario gave four quarts of berries to the bush. These berries were all very large, no small ones. The fruit and foliage of this variety were only slightly effected with mildew. So far this is a very promising variety.

Autocrat gave four quarts of large green berries, very sweet when ripe, and made a large growth of new wood.

This is the third large crop this variety has given in succession, Berries mildewed, but foliage very little.

Mrs. Whittaker gave a few berries and made a good growth of wood.

Carnie's Golden yielded fine berries, but is sprawling and a poor grower.

None of the large varieties dropped their fruit, their thick skin being a sufficient protection.

GRAPES.

Notes on Varieties, by M. Pettit.

(*Wentworth Station.*)

The experimental vineyard at this station was very badly injured by the very low temperature when the ground was bare last winter. Some varieties were entirely root killed, but fortunately nearly all had been tested long enough to find that many of them could not be profitably grown in comparison with the leading market varieties.

Varieties of Little Commercial Value.—The following is a list of those which are of little or no value, and, judging from my experience with them, should not be planted : Amber, Bell, Beauty, Carman, Centennial, Elicand, Empire State, Etta, Eaton, Esther, Golden Drop, Geneva, Herbemont, Lutie, Lady Washington, Monroe, Martha, Mason Seedling, Maxatawney, Montefiore, New Haven, Oriental, Oneida, Olitie, Poughkeepsie Red, Pearl, Rommel, Taylor, Triumph, Transparent and Ulster Prolific. I can find no other use for the above list than to help fill the nurseryman's catalogue and perhaps his pocket.

Wine Grapes.—The following list could be profitably grown for wine ; they are strong growers, productive and have suffered very little, if any, from root killing : America, Arnolds, Bacchus, Canada, Elvira, Greins Golden, Herman. Mo. Riesling, Noah, Marion.

The following described list as far as tested appear to be of some value :

Amber Queen. Bunch medium, shouldered berry oblong, holds well to the bunch ; amber colored ; flesh, tender and rich. Ripens with the Concord.

Brilliant. Bunch long, berry medium size ; dark red ; fine flavor ; strong grower, productive. Ripe first week in September.

Colerain. Bunch long, rather loose ; berry very large, oval ; white ; flaver good ; vigor medium.

Cambridge. Bunch large, shouldered ; berries large, black, oval ; thin skin. Ripens a few days earlier than Concord.

Dr. Collier. Large black, resembles Concord in appearance and flavor. Not quite as early ; productive.

Early Ohio. Bunch medium size, shouldered ; black ; rather acid ; better quality than Champion. About as early. Vine not as vigorous.

Early Victor. Bunch compact, shouldered ; berry round, black ; with heavy bloom. Adheres well to the bunch, juicy and sprightly ; very productive. A little earlier than Concord.

Moore's Diamond. Bunch compact, very large ; white ; good flavor. Vine not quite vigorous enough. Ripens a few days earlier than Niagara.

Opal. Bunch medium size, compact ; berry large ; white. Resembles Niagara. Tough skin. Flavor medium. Vine very vigorous.

Presley. Bunch below medium, compact ; berry dark red ; fine flavor. Vine vigorous. Ripe first week of September.

Watt. Bunch medium ; berry dark red ; oval ; very spicy and rich. Vine lacks vigor. Ripe second week in September.

Woodruff Red. Bunch medium, campact ; berry large ; oval : bright red and very handsome ; quality fair. Ripe first week in October. Very productive.

The above described varieties are valuable, and some of them may take a place with the old

reliable kinds, such as Worden, Concord, Delaware, Lindley, Wilder, Agawam and Niagara. We are much in need of a grape as early, hardy and productive as Champion and of good quality. Campbell's Early may take the place.

NUTS.

Notes on Varieties, by M. Burrell.

(Niagara Station.)

A further experience with the Japanese chestnuts confirms one in the opinion that it is unwise, if not useless, to attempt the transplanting of grafted trees of considerable size. Except in the case of the Spanish varieties no vigor of growth has been obtained at all, and it is extremely doubtful if Ridgely, Early Reliance, Alpha and others planted in 1896 and 1897 will ever make desirable trees. Greater success may be looked for by planting the chestnuts themselves or by grafting or budding young native chestnuts on the premises, where subsequent transplanting can be done under the most favorable conditions. The seedlings which were budded last fall and alluded to in last year's report, have made firm, stocky trees where the buds took. This spring those which had failed were crown-grafted. Budding, if done in time and if the season is not too dry, should be fairly successful. The Japan Mammoth and Parry's Giant chestnuts which were sent to the station this spring have most of them grown and are now from 15 to 20 inches high. Some of these were planted in the blanks of the experimental row of chestnuts and the rest in a nursery row. The Japanese walnuts are in a thrifty, healthy condition, and the English filberts have also made excellent growth.

PEACHES.

Notes on Varieties, by M. Burrell.

(Niagara Station.)

This fruit was the one which suffered most severely from the cold of last winter. In many orchards in the district from thirty to fifty per cent. of the trees were killed outright and others badly injured, very few orchards indeed escaping more or less damage. The losses were chiefly amongst trees up to five years old. On the high lands the losses were nearly as great as on lower levels, and nearly all varieties were injured. Neither was it a case of late ploughing contributing to the trouble, as, in the experimental plot which was ploughed and seeded down with crimson clover in the last of week July, a very large number of young trees were killed. Amongst those varieties in which all three trees were killed were, Chair's Choice, Early Michigan, Bilyer's Late, Jacques Rareripe. Elberta and Crosby. Amongst those suffering a little less were, Fitzgerald, Lorentz, Early York Tyehurst, Globe, Wonderful, Red-cheeked Melocoton, Shumaker and Triumph. Some of the varieties which escaped were, Louis Seedling, Morris White, Ostrander Late, May's Choice, Steadly, Troth's Early, Golden Drop, Thurbert, Lord Palmerston, Waterloo, Champion, Conkling, Susquehanna, Hortense Rivers, Bokhara, Home Chief, Marshall, Greensboro', Rosier, La Grange.

None of the experimental trees have yet fruited, so that no notes can be appended as to yield, quality, &c.

Thinning work was again carried out on a block of Hynes' Surprise trees, 5 years old, with markedly beneficial results. From four to eight hundred peaches were taken off each tree when about the size of hickory nuts, the cost per tree averaging about 10 cents,

Curl-leaf was scarcely to be seen in the orchards this year. Test rows were selected in the experiment block and the Bordeaux mixture and Whitewash treatments both applied, but so little "curl" appeared, even on the untreated trees, that it would not be safe to draw conclusions from the experiment.

Notes on Varieties, by M. Pettit.

(Winona Station.)

Some of the newer varieties of peaches planted in 1897 fruited this season.

The *Sneed* ripened earliest; a little larger than the Alexander; not as good flavor; too tender and juicy to ship well.

Greensboro. Large greenish-white with red cheek like Early Rivers, but richer and sweeter; ripe August 1st.

Triumph. A very early yellow peach. It resembles Barnard in size and appearance; ripe first week in August; yield, one basket to the tree.

Fancy Favourite. A fine, large, white-fleshed peach ; ripe August 8th ; yield, 15 quarts to the tree.

Fitzgerald. Large yellow, resembling Crawford ; yield, 10 quarts to the tree.

The peach trees were sprayed with Bordeaux mixture before the buds opened, and again after the blossoms dropped, leaving ten trees unsprayed, which showed a considerable more leaf curl than the sprayed trees.

Notes on Varieties, by W. W. Hilborn.

(*South-Western Station.*)

I scarcely know how to begin my report for this season, the two or three weeks continuous cold weather during the month of February wrought such sad havoc among the peach orchards that to look in any direction you choose, ruin and destruction is to be seen on every hand. Trees planted on soil most suitable to the growth of the peach suffered most. About 90 per cent. to 95 per cent. of all peach trees of all ages were killed. We had about 20,000 trees, most of them planted from five to nine years. Out of this number not more than 1,500 survived. A neighbor had 4,2 0 large bearing peach trees that had been well cared for and in splendid shape when they went into winter quarters. Out of this number he has only two trees that were not killed. Last spring about 1,000 acres of peach orchards was to be seen from the top of my house, at present there is not 50 acres of them remaining.

The trees were killed at the root. The top was not injured. They came out in full bloom. All varieties gave promise of the largest crop of fruit ever grown in this district when the top only was examined. But, alas, the roots were destroyed and in a few days after the blossoms began to open the trees began to succumb to their sad fate. Trees that escaped were those that had been planted in soil that for some reason did not dry out with the long-continued cold period. It was not the severe cold, but the long continued cold that did the mischief. In the autumn of 1898 the wood and fruit buds of the peach ripened up perfectly, and went into winter quarters in the best possible condition.

During the month of February we experienced about three weeks of continuous severe cold. About 14° was the lowest point reached on the ridge or high land. On lower lying land several degrees lower were recorded. When frost first enters the soil it expands and excludes the air from the roots. But long-continued frost dries out the soil, then it contracts and admits the air. This drying-out process while the roots were frozen was no doubt the cause of the trouble. There was no snow at the time to prevent the frost from penetrating to a great depth. Deep cracks were quite numerous in the soil, caused by the contraction from long-continued cold. The frost penetrated from two to three feet deep.

A small portion of the experimental plot was saved, principally of the last planting. This portion of the orchard had been sown quite early to Crimson Clover. Weeds also came up very numerous, together they made a sufficient mulch to protect the trees. Other portions of the orchard which had been cultivated better and less weeds came up with the crimson clover did not escape. Some orchards escaped with less injury that had been planted on low land or where quicksand was comparatively near the surface. This will no doubt induce others to plant on similar land, which will no doubt be a mistake, as trees on such soil are more liable to suffer from the changes in temperature which occur nearly every winter. Peach trees planted on low, rich, or moist soils do not usually produce fruit of the best quality. The trees make such a rapid rank growth that the fruit does not colour up properly and they are therefore of poor quality. On such soil they also grow so late in the autumn that they do not properly ripen up their wood and fruit buds, hence, are more susceptible to injury from the cold of winter. All varieties suffered about the same by last winter's frost. In some cases it would appear that some kinds escaped better than others, but when you examine those same varieties in other portions of the orchard you find perhaps every tree killed, while some other sorts considered more tender may remain. Everything goes to show that something prevented the soil from drying out where trees escaped, whether that was the grass weeds or the natural dampness of the soil.

I have not enough kinds left to give a satisfactory report on varieties this season. Those kinds that did survive were many of them more or less injured, and in many instances the fruit either dropped early or ripened prematurely. The following notes on a few of the newer varieties are all I can supply that would be of value to the planter.

Oscar's Black Prince, received from Monroe, Mich., much like Alexander in character, ripens a week or ten days later. Very much darker in colour and perhaps a little better in quality. Not desirable for a market sort.

Engols Mammoth, Large, nearly round, suture slight. Yellow, with red cheek. Flesh yellow, sweet and juicy. Stone small, free. Ripens between the two Crawfords. Keeps well after picking. Tree healthy, vigorous and productive. Very promising for both home use and market.

Pearce. Fruit large, golden yellow, flesh yellow, good flavor, ripens on or after the middle of September. Judging from this seasons fruiting it promises to be a valuable market sort.

Connecticut, from Hale, Conn. This variety is of the early Barnard type, of which it is probably a seedling. Not equal to that old standard variety this season. Unless it does better in the future it cannot be recommended for market, as there is so many better kinds ripening at the same season which is about with Barnard.

Bronson. Large yellow, with red cheek, flesh yellow, sweet, good, very promising market variety. Ripens middle to the last of September.

New Prolific. Fruit large, golden yellow, with crimson cheek, flesh golden yellow, very good, pit small, freestone. Tree vigorous, healthy and productive. Ripens just after early Crawford, very promising for market.

Namaper. A variety received from Stark Bros., Mo. Tree a good, healthy, vigorous grower, and appears to be hardy. Fruit large, oval, about the size and form of Elberta, rather better quality, and ripens a week or ten days later. Very promising for market.

Bokara. This variety, as I have it, is worthless. It is very small, white flesh, ripening with Salway.

Lorentz A medium size yellow peach of good quality, ripening after Salway, too late to be valuable in Canada.

PEARS.

Notes on Varieties, by M. Burrell.

(*Niagara District*)

The pear crop turned out better than was anticipated. At this station Sheldon, Lawrence and Beurré Clairgeau were lighter than usual, but Tyson, Seckel, Clapp, Bartlett, Keiffer, and Bosc yielded well. Blight was again in evidence on the Clapp's Favorite, and in spite of some good qualities, we hesitate to recommend the extensive planting of this variety. Tyson, though of vigorous and productive habit with fruit of good quality, is not highly desirable for commercial purposes owing to the small size of the fruit. The young pear trees on the experimental plot have nearly all made a good healthy growth. The pear slug did comparatively little damage in the district this season.

PLUMS.

Notes on Varieties, by A. W. Peart.

(*Burlington Station.*)

Plums were a fine crop of excellent quality ; 800 trees, ranging from three to seven years old, yielded 1,625 twelve-quart baskets. There was little or no rot, and the fruit was of a good size. Of the Japan varieties Ogon, Burbank, Abundance and Wickson promise to have a commercial place, not on account of their quality, but their fine showy appearance and seasons of ripening.

Abundance (Japan). Tree, an upright, strong grower. Fruit yellow, with reddish-crimson flush, large, oblong, round ; quality only fair. Season, middle of August. Fruits very young. Promises well for an early market plum.

Bradshaw. Tree upright, strong grower, hardy, moderately productive ; does not bear very young. Fruit large, oblong-oval, reddish purple ; flesh rather coarse ; quality good. Season, late August.

Burbank (Japan). Tree spreading, unshapely, irregular, but strong and very productive ; bears very young. Fruit medium to large, oblong-round, with red crimson flush : quality only fair. Season, middle of August. A very promising early variety.

Berckman (Japan). Tree upright, spreading, medium vigor. Fruit medium to large, dark red ; flesh very soft ; juicy ; quality poor ; oblong-oval. Season, late July.

Chabot (Japan). Tree spreading, strong grower. Fruit yellow, with slight crimson flush, slightly oblong, medium size ; quality only fair. Season, early September.

General Hand. Tree upright, spreading, very vigorous, hardy ; not very productive. Fruit very large, roundish-oval, yellow. Season, middle of September.

German Prune. Tree irregular, upright, spreading grower, moderately vigorous, hardy and productive. Fruit medium, purple, oblong-oval ; one side heavy. Season, September. A good market variety.

Glass' Seedling (Quackenbos). Tree upright, spreading ; a very vigorous grower, hardy, and very productive when it gets a little age. Fruit purple, large, roundish oblong ; quality good. One of the best commercial varieties.

Guii. Tree upright, moderately vigorous and very productive. Fruit purple, medium to large, oblong-oval ; quality good. Season, September. A good commercial plum.

Hudson River Purple Egg. Tree upright, spreading. very vigorous and very productive.

Fruit purple, very large, irregular oblong-oval ; quality first-class ; shows a tendency to rot ; should be picked slightly immature. Season, late August.

Imperial Gage. Tree upright, spreading, vigorous and very productive. Fruit yellowish green, medium to large, oval ; distinct suture ; quality excellent. Season, early September. A good market or garden variety.

Ireland's Seedling. Tree spreading, moderate grower, hardy and productive. Fruit medium size, almost round, crimson-purple ; quality excellent. Season, middle of August.

Italian Prune. Tree upright, spreading, moderate vigor, hardy and moderately productive. Fruit oblong-oval, with heavy side, reddish-blue, medium. Season, September.

Lombard. Tree upright, spreading, somewhat tender, very productive ; begins bearing young ; probably the most prolific of the older varieties here. Fruit medium, roundish oval, purple-red. Early September. One of the most profitable market varieties.

Marianna. Tree upright, spreading, very strong and rampant grower. A good shade tree but no use for fruit. Fruit red, small, roundish-oval, soft flesh, thick skin, poor in quality. Season, early to middle of August.

Monroe. Tree upright, sprea ing, vigorous, hardy and productive. Fruit medium, oval, yellow. Season, early September.

Niagara. Tree upright, strong grower, hardy and moderately productive. Fruit oblong-oval, large, reddish-purple does not bear very young. Tree and fruit resemble the Bradshaw very much, both in habits and peculiarities. Season, late August.

Ogon (Japan). Tree upright, strong grower, and promises to be productive. Fruit medium, yellow ; roundish oval ; quality only fair. Season, late July early August, a few days later than the Berckman. A promising new, very early variety.

Peter's Yellow Gage. Tree upright, spreading ; moderately vigorous, hardy and productive. Fruit medium, roundish-oval, yellow ; middle of August.

Pond's Seedling. Tree upright, spreading, vigorous, hardy and productive. Fruit very large, oval ; yellowish purple-red. Season, middle of September.

Prunus Simoni. Tree an upright, only moderate grower, somewhat tender and but moderately productive. Fruit large, roundish flat ; crimson-red ; short stem, adhering closely to the wood; quality poor. Season, August.

Prince of Wales. Tree upright, spreading, vigorous. Fruit yellowish-crimson ; roundish, oval, medium. Season, early September.

Purple Egg. Tree upright, spreading, strong grower, hardy and very productive. Fruit medium, oval ; dark purple. Season, September. A good commercial plum.

Reine Claude. Tree upright, spreading, somewhat tender, moderate grower, hardy and very productive. Fruit medium, roundish oblong, very meaty and firm ; sweet, rich ; one of the best plums for canning or preserving. Season, late September, early October. A very profitable orchard plum.

Staunton. Tree, an upright, strong grower, hardy and productive. Fruit medium, roundish-oblong, bluish purple, firm, of excellent quality. Season, early October. A profitable late plum.

Shropshire Damson. Tree spreading, hardy and productive. Fruit small, oval, dark purple ; quality fine. Season, late September, early October.

Smith's Orleans. Tree upright, spreading, vigorous, somewhat tender. Fruit medium to large, roundish oval, bluish bloom, reddish purple. Season, late August.

Shippers Pride. Tree upright, moderate grower, productive. Fruit oblong-ovate, purple, medium size. Season, September. A good commercial plum.

Satsuma (Japan). Tree strong, spreading grower. Fruit medium to large, roundish-conical, dark red, firm flesh ; poor quality. Season, late September. Does not promise well. A curiosity on account of its dark-red flesh.

Saunders. Tree upright, spreading grower, moderately vigorous, hardy and very productive. Fruit roundish ob ong, small, yellow, juicy, sweet, melting. Season, early to middle of August.

Washington. Tree upright, strong, vigorous and moderately productive. Fruit large, deep yellow, sometimes with a crimson cheek ; quality fine. Season, late August.

Wickson (Japan). Tree upright, strong. Fruit large, roundish conical, yellowish crimson-red. Season, early October. A promising plum.

Yellow Egg. Tree upright, spreading, moderate grower, productive, somewhat tender. Fruit large to very large, yellow, oval. Season, late August, early September.

Yellow Gage. Tree upright, spreading, vigorous and very productive. Fruit roundish oblong, yellow, juicy, rich. Season, middle of August.

Notes on Varieties, by John G. Mitchell.

(*Georgian Bay Station.*)

Last winter was the most severe we have experienced for many years. However, we had nothing killed outright except four dwarf Duchess pears, which were in a position very much

exposed to the full sweep of the winds, which blew the ground bare, and they were probably frozen dry. The buds on some varieties were killed, or very much weakened ; but these facts are of great importance in determining the hardiness of varieties. Lombard, Coe's Golden Drop, Reine Claude, Glass Seedling, Yellow Egg, Diamond, Moore's Arctic, Arch Duke, Grand Duke, Monarch and Kingston were about the only varieties of plums bearing a full crop.

Best Selling Varieties.—The experience of another fruit season still further proves the fact that the markets want only the large, smooth, clean, showy varieties ; for there seems to be no longer any money in growing small plums. The best selling kinds this year were: Washington, Bradshaw, Glass, Quackenboss, Pond's Seedling, Coe's Golden Drop, Reine Claude, Diamond, Arch Duke and Grand Duke. The last three are new fruits here and very promising.

Blaugh. Scions from Daniel B. Hoover, Esq., Almira, York county, Ont. Origin, Alleghany Mts. Tree, a strong upright grower. Leaves, large, glossy and very distinct, like Washington, Fruit, larger than medium, two inches long by one and one-half inches wide ; a smooth, clean, handsome plum. Color, light purple, covered with a beautiful light blue bloom, becomes darker as it gets riper. Flesh, yellow, juicy. Stone, cling. Quality, good. Season, September-October. This promises to be one of the best late colored plums.

Diamond. A strong upright grower. Fruit, medium to large, two inches long, one and one-half inches wide. Suture, distinct. Color, black, covered with a heavy blue bloom. Flesh, yellow ; a little coarse ; juicy. Stone, cling. Very handsome, excellent bearer and good shipper. Very profitable. Season, late September.

Kingston. Very like Diamond in every respect, so much so, indeed, that one would take them to be the same tree and fruit, there being but a very slight difference in the foliage.

Monarch. Tree a strong upright grower. Fruit, medium to large ; purple, covered with a heavy bloom. Fruit, yellow, juicy, slightly acid. Stone, cling. Splendid bearer ; will make a good shipper to distant markets ; very promising.

Saunders. Tree a slow grower forming a round compact head. Fruit, small, one and one-half inches long, one inch wide. Flesh, yellow. Stone, cling. Quality, good. Fruit grows very much in threes. A poor shipper and decays badly on the tree ; not a profitable variety here. Season, August.

Tatge. Hardy, very much like Lombard ; scarcely distinguishable. The latter appears the most desirable of the two. Same season.

American Plums.

Cheney. An upright, moderately strong grower. Fruit. small, round, one to one and a quarter inches. Color bright red ; very good quality for a wild plum.

Golden Beauty. Tree a very strong grower. Foliage a light golden color ; at a distance would make a pretty ornamental tree. Fruit small, yellow, conical. May be good for preserving ; too late for here ; ripe this season, just now (November 1st).

Pottawattomie. One of the most vigorous of the American plums. Tree a spreading, upright grower. Fruit one and one half inches long, one inch wide ; very pretty. Skin yellow, changing to clear bright red as it becomes ripe. Stem slender, three-quarter inch long. Good. Season, September.

Weaver. One of the best of the American sorts. Fruit inch to inch and a quarter, nearly round. Color dull red thickly set with small grey dots.

Wyant or *Sand.* Tree a scrubby grower ; fruit about size of Weaver and scarcely so good.

Note. None of the American plums so far tested are of any practical value here, but might be useful further north, where the more tender kinds would not succeed.

Japan Plums.

These plums are proving much more hardy than was expected. The following have fruited successfully here.

Abundance. This variety has just borne its second crop after one of the most trying winters, which sufficiently proves its hardiness. The fruit is large, of good quality, and very beautiful, but too juicy in my opinion to make a good shipping plum

Burbank. A variety sent out by Luther Burbank, of Santa Rosa, California. Tree is very hardy and vigorous, but the most spreading and sprawling in its habits of growth of any tree in the orchard. As regards productiveness, it is simply unequalled To produce the finest fruit, heavy thinning should be practiced The quality is excellent and it should make a good canning plum, while its attractive color and good shipping qualities should recommend it as a good market variety. It ripens ten days to two weeks later than Abundance ; ripe here last week of August or first of September.

Orient. Tree a very handsome symetrical grower, fairly vigorous. Fruit about as large as Burbank and resembles that variety very much. Quality good.

Red June. This is the earliest plum we have in test. Tree a strong grower, forming a large upright well shaped top, and bears the third year. Fruit medium to large ; color bright red ; conical ; quality good. August first. Hardy.

Chabot. Tree very much like Red June in habit and growth. Fruit about same size. Skin, amber, nearly covered with dots and splashes of red ; very attractive. Season, late September.

Hale's Japan. An upright, handsome tree. Fruit larger than medium. Skin, yellow, well covered and splashed with red, giving it a most attractive appearance. Quality good. September.

Hatankis. Tree a strong spreading grower. Fruit large. Color, lemon yellow. Season, late September.

Satsuma. Tree, a strong, spreading grower, like Burbank, but not so sprawling. Fruit about the same size and color.

Ogon. Medium size Color, lemon yellow ; flesh firm, and a free stone. Quality poor. Nearly all dropped from the trees. I do not think it will be of much use as a commercial plum.

Willard. This variety, although fairly vigorous, is the slowest grower we have among the Japan plums. It is said to be a great bearer, but has done poorly with us so far. Size, medium. Color, dull red. Very early ; last of July. Quality very poor ; indeed as compared with others we regard it as of little use.

Although a good many of the Japan plums, most undoubtedly are proving sufficiently hardy, and of exceedingly attractive appearance, yet they are not the equal in quality to our best European varieties. We therefore would advise not to plant largely of Japan plums until we know still more about them.

Notes on Varieties, by M. Burrell.

(*Niagara Station*).

The plum crop has been a heavy one in the district this year, and where spraying was resorted to thoroughly, an excellent sample was the result. In the Domestica class the following gave the best yields :—Prince's Yellow Gage, Moore's Arctic, Bradshaw, Lombard, Washington, Yellow Egg, Reine Claude, Coe's Golden Drop and English Damson.

Moore's Arctic has been a good deal abused, and is undoubtedly of inferior quality. It is a fair cooking plum, however, when well matured ; and on account of its earliness, hardiness and productive habit is of considerable commercial value. We took this year from nineteen ten year old trees 140 baskets, which sold at from forty to fifty cents. per basket, the result comparing very favorably with those obtained from other kinds. Lombard, for instance, though of better quality, is of a poorer color, is far more subject to rot, and comes on the market when plums are at their lowest. General Hand, a magnificent green plum, has in this section proved itself too shy a bearer to be of any commercial value. Coe's Golden Drop may be considered a valuable late yellow plum ; it is a slow grower but hardy, good quality and very productive. It is, however, very subject to rot.

Japanese Type. Out of some 150 trees, comprising about fourteen varieties only one tree was winter killed. The Japanese plums are certainly proving themselves hardier than many people expected. Abundance and Burbank cropped well this year. The claim that these varieties are not attacked by the curculio, is, of course, absolutely without foundation. Abundance I consider the best quality of any Japanese plum I know, which is not very high praise. It ripens very unevenly, necessitating some three pickings, is subject to rot and uneven as to size. It ripens with us about three days in advance of Moore's Arctic, and five or six days ahead of Prince's Yellow Gage. Burbank is of poor quality, showy appearance, large, a very heavy yielder, but particularly subject to rot. It remains to be proved how these varieties will stand the strain of ten or twelve bearing years, or whether the durability of the trees will compare at all favorably with the better varieties of the Domestica type. Vigorous thinning of the fruit should be practised, especially in the case of Burbank.

Notes on Varieties, by M. Pettit.

(*Winona Station.*)

About thirty varieties of plums were planted at this station during 1894 and '95. Most of them bore the first crop this year. It was very light on many of them, when compared with the size of the trees, also in comparison with an orchard of Lombards joining the experimental plot, planted in 1895.

Red Nigate. Ripened July 18th. A small red plum ; drop from the trees before fully ripe ; yield, four quarts to the tree ; planted in 1897.

Willard, Ripened July 20th ; about the size of Lombard ; a little darker color ; gives promise of being profitable on account of earliness and good shipping qualities ; yield, six quarts to the tree ; planted in 1894.

Ogan. Another of the earliest ; a light-coloured plum of inferior quality ; ripe Aug, 5th ; yield, seven quarts to the tree ; planted in 1894.

Abundance. Planted in 1895 ; yield, sixteen quarts to the tree.

Burbank has many good qualities for a leading market variety; early, strong, strong grower, very productive, long keeper, good shipper and of good appearance and quality.

Grand Duke is one of the most promising of the later plums.

RASPBERRIES.

Notes on Varieties, by A. W. Peart.

(Tested at Burlington Station.)

Raspberries were a fair crop. The raspberry slug did a great deal of damage in plantations that were not cared for. I found spraying with hellebore an effective remedy. The Marlboro and Cuthbert still hold their own as profitable commercial varieties. The former however requires thorough cultivation and liberal fertilizing to keep up its vigor. During the drought the crop is very materially prolonged and increased by cultivating the soil every other morning through the picking season, thus checking evaporation, and permitting the plants to receive the benefit of any moisture there is in the soil, of the newer varieties of red raspberries the Miller and London bid fair to equal the two varieties mentioned above as commercial berries. They are both good plants, productive, hardy, and have excellent commercial qualities. We do not find either the yellow, black or purple raspberries so profitable as the red.

All Summer. Plant, upright, moderate vigor, hardy, fairly productive. Fruiting more or less from early July until late October. Fruit, red, medium size, sweet and aromatic. Not a desirable commercial variety.

Columbian. Plant, upright, strong, very vigorous, hardy, and productive. Fruit, purple, medium to large; quality, fair. Season, medium to late A promising new variety.

Cuthbert. Plant, upright, very strong, and very vigorous, hardy and very productive. Fruit, large, conical-round, bright-red, fairly firm; quality, good. Season, medium to late. One of the best market varieties.

Golden Queen. Plant, upright, strong, hardy and productive. Fruit, yellow, large, of excellent quality. Season, medium. Probably the best yellow variety.

Gregg. Plant, upright, vigorous, hardy, and moderately productive. Fruit, black, large; quality, fair. Season, medium to late.

Hilborn. Plant, upright, moderately vigorous, hardy, and very productive. Fruit, black, medium to large, of excellent quality. Season, medium. A desirable market variety.

Japan Wine. Plant, spreading, vigorous, but tender and unproductive. Fruit, small, scarlet-red, obovate-conical, very acid. Of no commercial value here, but showy and interesting on account of its Oriental appearance. Season, late.

Kansas. Plant, upright, strong, very vigorous, hardy and very productive. Fruit, medium to large, black of fine quality. One of the best market varieties here. Season, early.

London. Plant, upright, strong, vigorous, hardy, and productive. Fruit, large, red; quality, good. A very promising berry. Season, medium to late.

Lovett. Plant, upright, of moderate vigor, hardy, and fairly productive. Fruit, red, medium, fair in quality. Season, medium to late.

Marlboro. Plant, upright, moderate grower, hardy, and very productive. Fruit, large, red, firm; quality, fair. Season, early. One of the best market varieties.

Miller. Plant, upright, moderately vigorous, hardy and productive. Fruit, large, red, firm quality, good. Season, early to medium. A very promising new variety.

Ohio. Plant, upright, strong grower, hardy, and productive. Fruit, black, large; quality excellent. Season, medium to late.

Older. Plant, upright, spreading, moderately vigorous, hardy and productive. Fruit, black, large to very large; quality, fair. Season, early to medium.

Palmer, Plant, upright, spreading, moderately vigorous, hardy, and productive. Fruit, medium, black, sweet. Season, early to medium.

Progress. Plant, upright, spreading, moderate vigor, hardy; not very productive. Fruit, small to medium, black; quality good, sweet. Season, early.

Redfield. Plant, upright, moderate growth, hardy, and moderately productive. Fruit, purple, medium to large; quality, fair. Season, late.

Reliance. Plant, upright, moderate growth, hardy, and productive. Fruit, dark-red, large, of fine quality. Season, medium. A promising variety.

Shaffer's Colossal. Plant, upright, strong, vigorous, hardy, and productive. Fruit, purple, large; quality, fair. Season, medium to late. A good canning variety.

Smith's Giant. Plant, upright, very strong, and vigorous, hardy, and productive. Fruit, black, very large; quality, good. Season, late. A promising new variety.

Souhegan. Plant, upright, spreading, moderately vigorous, hardy and productive. Fruit, black, large, of good quality. Season, medium.

Thompson. Plant, upright, light grower, hardy, moderately productive. Fruit, red, medium; quality, fair. Season, medium to late.

NOTES ON VARIETIES, BY A. E. SHERRINGTON.

(Lake Huron Station.)

RED RASPBERRIES.

The red raspberries are grown on the hedge row system. The rows are six feet apart, and the plants were set three feet apart in the row and then allowed to fill in; each variety occupies 18 feet of the row with a space of 2 feet between each variety which is kept clean. The stake, bearing the name of variety, is in the centre of an open space. Soil, clay loam. Fertilizers used, barn manure and wood ashes. They are kept well cultivated and clean until fruit commences to ripen, then straw is spread under the plants and space between rows, which keeps the fruit clean and permits the escape of moisture. The record of yield is made from weighing, bnt in report it is given in quarts or boxes, allowing 16 oz. to a quart. The pruning is done in the fall by cutting out the old and weak canes, and in the spring by shortening the canes to good healthy wood.

All Summer. Plant hardy and healthy, of dwarf habit; growth 26 inches; berry, medium size; color, red; quality, fair; yield 3½ quarts, ripe July 18; not profitable.

Brandywine. An early, red variety; plant hardy; canes small and weak; growth, 36 inches; berry small and soft; quality medium; yield 6¼ quarts; ripe July 4th. This one was badly broken down by the snow.

Brinckle's Orange Plant tender and weak; berry soft; quality poor; color yellow; yield 2½ quarts; ripe July 4th; growth 24 inches.

Cuthbert. Plant hardy and healthy, canes strong and vigorous, growth, 60 inches; berry large, firm, and of the best quality; color, dark red; yield, 18 quarts; ripe July 12th. This is the best all round berry grown.

Caroline. Plant hardy and healthy; fairly vigorous; growth, 45 inches; berry small and soft; quality of the poorest; yield, 23¾ quarts; ripe July 10th. Not worth cultivating.

Golden Queen. Canes strong and healthy, vigorous and hardy; growth, 50 inches; color, yellow; berry large, quite firm, and of very good quality; yield, 16¾ quarts; ripe July 12th. The best light berry.

Hansell. Canes weak and lacks vigor; color red; berry small and soft; yield, 8½ quarts; ripe July 4th. No good.

Louden. Poor grower; does not fill up the row; growth, 24 inches; color red; berry large, fine, quality very good; yield, 10 quarts. ripe July 6th. Not doing well.

Marlboro. Plant of dwarfish habit, but healthy; growth, 24 inches; berry large and firm; quality fair; color light red; yield, 11¼ quarts; ripe July 6th.

Miller. This variety is improving; plant healthy and hardy; quite vigorous, with fairly strong canes; growth, 50 inches; berry medium to large, firm and of fair quality; color light red; yield, 25 quarts; ripe July 6th.

(No Name). The label was lost off this variety when the plants reached me for planting, and I have not been able to identify it yet; it resembles Phœnix very much, but yields better than that variety. Plant healthy and hardy, fairly vigorous; growth, 40 inches; color bright red; berry medium to large, and firm; quality good; yield, 31¼ quarts; ripe July 12th. A good one.

Phœnix. Plant moderately vigorous, healthy and hardy; growth, 40 inches; color, bright red; berry medium to large, and firm; yield, 22¼ quarts; ripe July 12th.

Reliance. Canes rather small and weak; growth, 36 inches; color red; berry small and soft; quality only medium; yield 11¾ quart; ripe July 4th.

Rancocas. Canes too small and weak, apt to go down with the snow; growth, 30 inches; color red; berry small and soft, quality fair, yield, 5 quarts; ripe July 6th. Not worth growing.

Turner. A very hardy and healthy variety, moderately vigorous; growth, 45 inches; berry rather small, quality medium to good; valuable owing to its hardiness and early ripening qualities; yield, 24 quarts; ripe July 4th.

Thompson. An early red variety; hardy and healthy; fairly vigorous; growth, 40 inches; berry a little soft; quality fair, but not as good as Turner; yield, 13½ quarts; ripe July 4th.

White Champlain. This variety is of no use, and will be discarded. plant weak and tender; growth, 24 inches; berry white, medium size; quality fair; yield, 1½ quarts; ripe July 6th.

Zetler. This is a local berry; plant hardy and healthy; fairly vigorous; growth, 40 inches; berry medium to large, a little soft, but firm enough for near market; color light red; yield, 10½ quarts: ripe July 6th.

BLACK RASPBERRIES.

The black raspberries are grown in rows six feet apart and three feet apart in the row, cultivated and fertilized the same as the red varieties. Pruning.—The pruning of the blackcaps is done by pinching off about two or three inches of the young canes when about 24 inches high, and

in the fall the old canes are all cut out close to the ground. Then in the spring the side branches are shortened back to the desired length.

Conrath. Plant strong and vigorous, appears to be hardy; two years planted. Berry large, firm, and of the best quality; yield, per six plants, 22½ quarts; ripe July 10th. A good one.

Columbia. The plant is rather a poor grower and a little tender. Berry large, firm, and of fair quality; color purple; yield, per six plants, 5 quarts; ripe July 18th. No use for market owing to its color.

Gregg. A vigorous grower, but tender; quality good; berry large, with a fine bloom: yield, per six plants, 4½ quarts; ripe July 15th.

Gault. This variety is not doing as well as expected at first; plant rather weak and tender; berry large and of fair quality; yield, per six plants, 8 quarts; ripe July 4th.

Hilborn. Plant vigorous and very hardy; berry medium to large; quality good; yield for six plants, 15 quarts; ripe July 10th. A safe one to plant.

Kansas. A good grower, not as hardy as was at first thought to be; berry large, firm, and of the best quality; yield, for six plants, 22½ quarts; ripe July 10th.

Lovett. A moderate grower, fairly hardy: berry medium, very black, with large drupes; a little soft; yield, per six plants, 6½ quarts: ripe July 6th.

Lottie. Resembles Lovett very much in growth, but the berry is smaller; quality poor; yield, per six plants, 10 quarts; ripe July 10th.

Mammoth Cluster. If this is correct the name is by far the best part of it; plant is about the poorest grower on the grounds; berry very small, hard, and of poor quality; yield, per six plants, 3 quarts; ripe July 4th. (Probably this is not the true Mammoth Cluster.—Secretary).

Ohio. A fair grower, but a little tender; berry medium size; quality very good; yield, per six plants, 11¼ quarts; ripe July 10th.

Older. Two years planted; it is of spreading habit so far; hardy; berry large and of good quality; yield, per six plants, 6¾ quarts; ripe July 10th.

Pioneer. Medium grower and hardy; berry small; quality not good; yield, per six plants, 9¾ quarts; ripe July 6th.

Progress. Very similar to Pioneer in every respect; yield, per six plants, 9¾ quarts; ripe July 6th.

Red Field. Plant a good grower and hardy; berry small and soft; of the poorest quality; color purple; yield, per six plants, 8¼ quarts; ripe July 12th. No good.

Shaffer. A strong, vigorous grower, but a little tender; berry very large; quality very good for canning; color purple; yield, per six plants, 14¼ quarts; ripe July 12th. Does not sell well owing to its color.

Smith's Giant. Very vigorous, not quite as hardy as it ought to be; berry very large; quality good; yield, per six plants, 10½ quarts: ripe July 12th. A good one.

Logan. I managed to save one plant out of six of this variety, but it has not made more than six inches of growth in two years, and of course set no fruit.

Japan Golden Mayberry. This variety is too tender for this district. It is killed down to the ground every winter; has not fruited yet.

Strawberry Raspberry. There is no killing out this variety, it continued to spread and yielded quite a crop of large fine fruit. The berry is very handsome in appearance, but the quality is extremely poor. The plant dies down to the ground every winter and comes up in spring, fruiting on the young canes, which grow to the height of about 12 to 15 inches. It is very ornamental, but will never become a market berry: yield, per 12 feet of row 2 feet wide, 20 quarts; ripe July 28th.

Notes on Varieties by M. Burrell.

(*Niagara Station.*)

The severe weather of last February, when the thermometer in this district remained steadily below zero for a whole week, touching 14 degrees below in some points affected the raspberry patches disastrously. A large percentage of the canes were killed, and a small crop resulted. The varieties planted for testing purposes here in 1897 made a fairly good showing.

Royal Church proved a good bearer, and a fairly vigorous grower. The fruit was large, moderately firm, and of excellent quality.

London. Vigorous, hardy and quite productive. Berries large, with large grains, and fine red color; quality good.

Miller. Moderately productive, not a very vigorous grower, early and good quality.

Columbian. This hybrid of the Shaffer type bears out its reputation for vigor and productiveness, but the quality is not high, and the objectionable color will probably prevent its being a popular variety.

Older. Black Cap. Hardy, fairly vigorous, large in berry, and good quality, a promising variety.

Conrath. Black Cap. Early. Deep black in berry, not very firm, only a fair grower.

Smith's Giant. A strong grower and one of the best of the newer black caps. Hardy, very productive, good as to size and quality.

STRAWBERRIES.

Notes on Varieties for 1899, by E. B. Stevenson.

(*Strawberry Sub-Station*).

The season of 1899 was a peculiar one and not altogether satisfactory. The strawberry crop is variable and uncertain, although you may take every pains with soil, planting and cultivation, you are not able to tell whether the crop will be a large or small one until harvested and sold. The first part of the picking may be good, the latter part poor and unprofitable from heat and drought.

The grower of strawberries is not able to hold his crop over for higher prices and better returns, if the prices are low when he picks his crop of berries, as the grower of hay or wheat is, who sometimes after holding for higher prices accepts a smaller price than he could have obtained in the first place. The crop of strawberries is picked, sold, and used not very long after it is out of the pickers hands, so that it is not long before the strawberry grower knows what returns his strawberries are going to make.

There are many things that have to be favorable for a good crop of strawberries. Sometimes late frost will blight in one night all his bright hopes of a paying crop, or a season of hot dry weather will set in just at or after blooming time and continue until his hopes vanish into thin air.

While the strawberry crop is very uncertain from the above causes, yet the way the plants have been cared for has a great deal to do with the matter as to whether you have a paying or non-paying crop.

First you have to plant in suitable soil well enriched that will bear a good crop of anything else, as, for instance, turnips or corn ; then you have to secure good, strong, healthy plants, get them as near home as possible so that they may be planted while fresh (I plant with a spade) ; after planting they must have good cultivation, all weeds kept down, the rows confined to about sixteen inches in width, runners being cut off after that width is secured.

If plants are put in on poor soil and not cared for, or poorly looked after, and a poor growth of plants is made, no one need expect a good crop, even if all other things are favorable. But no matter how good a growth the vines have made, if no protection is given during the winter and it should be a severe one like last winter, the temperature for a week being below zero, many of the plants will be killed or seriously injured ; that the best results will not be satisfactory, as a good crop could not be obtained from such conditions.

While the winter of 1898-9 was unusually severe, those beds that had been protected came out in the spring in very good shape ; the spring was backward and cold, retarding growth, while many old beds not protected were killed out completely, and many new beds not protected were so seriously injured that very little fruit was picked from them.

The season of 1898 was not very favorable for plant-making, in many sections too dry until too late in September to secure a good row. So the plants went into winter quarters poorly provided with protection, and when not given it artificially they suffered very severely, while on beds protected, the bloom was very free and the season of blooming on the whole favorable for pollenizing, and the plants made great preparation for a large crop, but severe drought set in and greatly shortened the season,

One peculiarity about the past season was the fact that with us there were virtually no early or late kinds, all were in bloom together and all fruited together, or with very little difference in time between them. Varieties that in an ordinary or average year would be in bloom two weeks after other sorts, bloomed at the same time this year ; the early kinds were retarded by the cold, late spring.

The prices received were very fair, running from six cents to nine cents per box wholesale ; the better kinds, however, the fancy sorts, bringing from ten to twelve cents per box wholesale. This shows that it pays to grow the best kinds, for while the old common kinds were only bringing from four to five cents, these sorts cost as much to grow and more to pick, but did not bring in the market more than half the price of such varieties as Clyde, Bubach, Seaford, etc.

It may be claimed, as it is by some, that the common kinds bear larger crops ; not so. The Clyde will bear as many boxes as the most prolific small common kind, fewer berries, perhaps, but more boxes and higher prices.

There are now so many varieties that are so large and productive and fine looking and that are firm and good shippers being cultivated, that it is really too bad that some of our markets are flooded with very inferior varieties that are out of date and are not grown by the best and most progressive growers, ; which are not any more productive than the larger and better kinds, and which are so decidedly poor in appearance that many people now will not have them

at any price when they can get the better kinds. To give one instance as a sample of the above; I know of a grower who continued to grow the Crescent and Wilson and such kinds because he had the plants himself or could get them for the digging, and would not buy the better kinds, while a neighbor of his in the same village paid $5.00 per 1,000 for Bubach and Jessie plants. The next season the Crescent man could hardly get rid of his large crop and one day contracted to furnish 2,000 boxes at one and one-half cents per box, while the Bubach man had contracted his whole crop of Bubach for eleven cents per box. Thus was seen one man who could only with difficulty dispose of his crop, the other had no difficulty in getting good prices. This was in a year when there was a large crop and markets glutted with poor fruit. It would have paid the Crescent man to have let his rot on the ground at the price he was getting, one and one-half cents. The Bubach man was getting a very good return for his investment.

Had it not been this year for the very hot, dry weather that set in in fruiting time the crop would have been very large in those plots that came through the winter all right.

There was little or no rust to speak of, even on Wm. Belt, Hunn and such varieties that usually have considerable rust.

Of the older standard varieties

Bubach seems to be weakening in plant vigor. While it gave a fine crop of grand berries, the fruit stalk was shorter and the fruit closer to the ground (than I ever saw it) which is an objection.

Haverland. I believe the Haverland is just as vigorous as it ever was ; plant good runner, the berry bright, glossy and long, a little light in color, but beautiful looking ; on moist soils it leaves a tremendous crop , is one of the best that has been in general cultivation for the past ten years.

Clyde. I predicted some years ago when I first got the Clyde plants from its originator, Dr. Stayman, that it would take a front place, and it stands there to-day. As a large, firm, good flavored and wonderful producer, the Clyde is not and never was surpassed. The Haverland comes nearest to it of any that I have had experience with, and I have grown all the new varieties that have been offered for the past ten years, and have discarded hundreds of high-priced and much lauded kinds that I found not worthy of a place among the standards. I believe its wonderful productiveness will in time impair the vigor of the plant. The berry then will decrease in size, but at the present it easily stands at the head of the list. To secure one such variety (every ten years) as the Clyde, Glen Mary, Haverland or Seaford it is worth all the labor of testing the many worthless kinds that are offered, and when we do find one such variety among the many kinds that have one or two good qualities and perhaps thus seem great berries to their originators, but which we feel are not worth retaining, we are repaid for all the time and trouble we have spent on the discarded kinds.

Annie Laurie. (Perfect.) Is of first quality, one of the best table varieties ; not productive enough for the market growers.

Bismarck. (Perfect.) It bore a very large crop of large, beautiful berries and paid well, they were so attractive looking ; brought good prices.

Boynton. (Imperfect.) This variety so closely resembles the old Crescent that you cannot tell the difference. To those who want the old Crescent they will find a slight improvement in the Boynton ; the fruit is almost identical with Crescent.

Brandywine. (Perfect). Did well ; fruit large ; fine quality ; a good one ; some may think it does not bear enough, but it was productive the past season.

Carrie. (Imperfect.) Resembles the Haverland very much ; it bore a good crop of large, finger-shaped berries, perhaps on account of not being well fertilized ; there were a good many imperfect shaped berries toward the end of the picking season.

Bubach. (Imperfect.) Too well known to need any description, only to say that it did well and held its place as a standard the past season.

Clyde. (Perfect.) Already described.

Eleanor. (Perfect.) Produced a good crop of fine berries ; among the early ones ; dark color ; tartish ; a good early kind.

Geisler. (Perfect.) Did well this season ; the patch was white with bloom ; it was among the first in bloom ; the plant is strong and healthy, good grower ; the berry is long and blunt at end ; resembles the Seaford.

Glen Mary. (Perfect.) Bore a good crop of immense berries, bringing highest price ; some of the berries have a hard, green, seedy end. Not the best quality, but size sells them. Plant strong, vigorous and healthy.

Greenville. (Imperfect.) So well known and widely grown and succeeded so well, no danger or risk in planting it.

Hall's Favorite. (Perfect.) Bore a good crop of fine berries, resembling the Splendid. There are others better, for instance, the Splendid is more desirable.

Jersey Queen. (Imperfect.) Did well.

Lovel. (Perfect.) Did well. This and the foregoing are so well known need no description.

Margaret (Perfect.) This is one of the later candidates for favor. This variety did well,

bearing a very large crop of the finest fruit, bringing the highest price in the market ; it is a late sort. This variety wil' repay the best cultivation ; plant good grower, strong and healthy ; very desirable sort.

Marshall. (Perfect.) This variety will not do very well ; makes only a few plants and bore only a few berries, but what it did bear were very fine. A variety that market growers will not find profitable for them to grow.

Michel's Early. (Perfect.) Did not do well here this season ; was not any earlier than many other kinds that were very much larger and finer looking.

Mastodon. (Imperfect.) Was a success. It bore a fine crop of the largest and finest berries and brought the highest prices. It very much resembles the Burbach ; same in plant growth.

Nick Ohmer (Perfect.) Did very well this season. The plant is a strong grower, perfect bloom, quite productive of large, firm, deep red berries, and I consider of very good quality. It is pushing its way to front rank ; a good market variety if treated well ; it will need good cultivation to do its best, but it will repay all the cultivation and care you may give it.

Ruby. Perfect.) Here is another good one. It produced a very large crop of best berries, firm and good quality ; the plant is a good grower and very productive ; sometimes has some rust.

Ridgeway. (Perfect.) A strong grower. Did not do as well as last year, but a good one and worthy of a trial.

Saunders. (Perfect.) Did well ; bore a fine crop of good berries of best quality ; firm and good shipper. Some a little seedy and hard at end, but sold well for good prices ; a profitable kind for market growers.

Seaford. (Perfect.) The Seaford has quickly grown into favor. It is mid-season, like the Bubach. It bore a very large number of the finest berries and best quality ; it delighted me with its behaviour this past season. The plant is strong and good grower ; the berry is quite firm ; a good shipper. This is one of the kinds when you come across it you feel repaid for all the trouble and the many disappointments you have had with the many new kinds that do not come even in sight of the good qualities their introducers claim for them. This will take, indeed has taken, a first place among profitable strawberries.

Sharpless. (Perfect.) So well known needs no description. Bore some very fine, delicious berries, but not enough of them to be profitable for market grower.

Sunrise. (Perfect.) This sort did not do well this year ; is not a very desirable one, although in some soils and places it is profitable.

Splendid. (Perfect.) A good strong grower, healthy and very productive ; berries medium to large, and roundly conical ; firm and quite early ; good shipper and profitable as a market variety.

Staples. (Perfect) A good early one to fertilize early pistillates ; bore a fair crop of good berries.

Tennessee Prolific. (Perfect.) This was one of the good kinds this season as well as in the past ; bore a very large crop of medium to large sized berries, bright, nice looking, firm and a good shipper.

Van Deman. (Perfect.) The season of this variety was the largest of any kind ; produced a good crop of the finest quality ; it seems to be losing its vigor of plant ; not much earlier the past season than many others.

Warfield. (Imperfect.) A very productive ; only medium in size ; goes well with the Staples or Eleanor to fertilize ; a good shipper ; suffers very much from hot, dry weather.

Wm. Belt. (Perfect.) This is a fine variety ; bore well ; large, fine-looking berries, and of fine quality ; brought best prices in market ; the first berries very large and somewhat irregular sometimes.

Williams. (Perfect.) A good market variety, resembles the Saunders in fruit but not in plant ; about the same season ; bore a good crop of firm berries ; greatest objection, nose white and somewhat seedy.

Woolverton. Perfect.) A fine, fancy kind ; bears good crops of choicest berries, which bring the highest price of any ; it is a profitable one to grow ; plant strong and healthy.

Of the newer varieties fruiting for first or second year, the following are worthy of notice:

Bird. A seedling grown by W. F. Bird, of Michigan. The plant is a very strong, healthy one, making a wide row ; the fruit is large and roundly conical ; good scarlet color, good quality and productive.

Cobden Queen. (Imperfect.) Originated by John McCaffrey ; a seedling from seed of Wilson ; a fine, healthy, strong grower ; makes lots of ruimels ; sometimes rusts a little ; fruit round, crimson, medium in firmness ; good quality and productive ; a good medium.

Benoy. (Perfect.) This was grown and sent out by Mr. Benoy, of Indiana, from seed of Bubach and Jessie. Plant a very strong one ; a good grower, runs freely and no rust ; the fruit is quite large, crimson ; firm, good quality ; ought to do well.

Earliest. (Perfect.) After close examination, I do not see any difference between this

sort and Michel's Early. Some growers say they observe a slight difference, that the berries are more conical and not quite as high quality, but I must say I do not observe any difference in plant, fruit, time of blooming and ripening ; on these points they are in my eyes the same.

Jerry Rusk. (Perfect.) This is another seedling grown from seed of Bubach fertilized with Jessie, by Mr. Benoy, of Indiana. The plant is healthy and a strong grower ; no rust. Mr. M. Crawford says of it " It is one of the most productive large varieties" ; another grower, " that it is the only one that will surpass the Bubach on his place." It is a good plant maker. The fruit is quite large, roundish conical, bright crimson, golden seeds, good quality and productive.

Stahaline-Fred. (Imperfect.) This is a seedling grown by Mr. Fred Stahaline, of Michigan. The plant is a very rampant grower, very vigorous and no rust on it. The fruit is round, somewhat conical in shape and large in size ; the color is bright light crimson ; good quality and productive.

Seaford. See account given above of Seaford.

Sample. (Imperfect.) Sent out by C. S. Pratt, of Massachussets. Was claimed to be " the most wonderful berry of the 19th century." The plant is a strong grower, making plants freely ; healthy, no rust. The fruit is large, roundly conical, with blunt end ; good, bright color, looking very well in basket ; only medium in firmness and poor in quality. It was quite productive, but did not bear as many as the Clyde. It is a good one and will be grown largely on account of its size and productiveness.

Star. (Perfect.) A good, strong grower. It is so very like the Sharpless, that a description of the Sharpless would describe the Star. I do not think it is any better than the Sharpless. There was no need to put on the market another such variety.

I fruited a great many more varieties that I do not consider of value enough to give them a place in my report.

New Varieties.

Of the new varieties that I have in the trial plot and that will fruit with me for first time next year, when they will be reported upon, are the following :

Bubach No. 3298. Seedling from Missouri Experimental Station. It has made a good growth of plants ; healthy and strong.

Clyde No. 800. In plant very like its parent ; strong, vigorous grower.

Crescent No. 1801. Seedling of Crescent, by the Experimental Station, of Missouri ; plant good grower, strong and healthy.

Dalling's Bride. Has made a good growth ; is reported to be very early.

Excelsior, Elba, Emperor and Empress.—Both these two latter are seedlings grown by the late John Little ; they are very strong growers, plant very large, making a good growth and free from rust.

Frederick, Gladstone, Klondike, Leo, Morgan's Favorite, Maximus, McKinley, Pride of Cumberland Varies and others, all have made a good growth in plants. They were planted on a moist, sandy loam, in good condition, and have gone into winter quarters in good shape.

Early and Extra Early Varieties.

Among the earliest to ripen were : Van Deman, Mayflower, Earliest, Michel's Early, Excelsior, followed very closely by Clyde, Eleanor, Staples, Lord Sheffield and Warfield.

Medium early to mid-season varieties : Bubach, Haverland, Tennessee Prolific, Bismarck, Seaford, Ridgeway, Glen Mary, Wm. Belt, Nick Olimer, Splendid, Ruby, Mastodon, Carrie, Brandywine.

Later Varieties—(Mid-season to Late.)

Aroma, Equinox, Margaret, Gandy, Hunn, Saunders, Williams, Woolverton.

There are a great many others that we might give a report of. Some of them of some merit, but have some serious defect, so that we have not thought it wise to burden this report with a description of them.

GENERAL NOTES.

Burlington Station.

There are 225 varieties of fruits at this station made up as follows :

Currants	22	varieties.
Blackberries	22	"
Pears	33	"
Plums	47	"
Grapes	24	"
Raspberries	28	"
Peaches	18	"
Apples	25	"
Cherries	4	"
Quinces	1	"
Mulberry	1	"

A small proportion of vines, bushes and trees were destroyed by the severe frost of February, probably not more than 5 per cent. in all. Grape vines and blackberries suffered the most severely. With this exception fruit-stocks are in good condition. Upon the whole the fruit crop has been a satisfactory one. Prices ruled exceptionally high for many lines thus leaving a substantial margin of profit. The severe drouth which began in May was practically unbroken until the 1st of October. Raspberries, blackberries and strawberries suffered in consequence, but currants and the tree fruits held their own remarkably well. Injurious insects were unusually plentiful, more especially the codling moth or apple worm, and the tent caterpillar. There was but little fungi, fruits being exceptionally clean. Spraying for leaf eating insects is a work of necessity, and is generally adopted.

Apples were a fair crop. The codling moth ravaged the fruit very badly, but it was clean and well formed.

Grapes were a good crop of excellent quality. There was little or no mildew save on a small proportion of the Brighton and Lindley.

Peaches were a good crop of fine quality.

Pears were a fair crop of excellent quality. Even the Flemish Beauty was free from the spot.

Cherries were also a good crop with exceptionally high prices.

East Central Station.

Commenced pruning orchard March 10th and finished April 12th. Sprayed 50 trees March 28th with sulphate of copper and lime.

April 15th, sprayed all orchard trees.
" 19th, " all pear and plum trees.
" 26th, " apple, pears and plums and cherries.
" 29th, " all young trees, apples, pears and plums.
May 14th, " whole orchard.
July 17th, " last time.

Results : Trees first sprayed were cleanest and largest of all and best colored fruit, I intend to spray twice at least before blooming hereafter. We did not have a nest of caterpillars in entire orchard. I should have sprayed once later than we did as the fungus or black spot appeared late in the season on some varieties. Take it all around we have from 75 to 80 per cent. clean fruit and only a few wormy and these were mostly the largest samples, proving that the early formed fruit suffered most. Our apple crop was not heavy owing largely to it being the off year with us. Boston Star, Northern Spy, Wealthy and Princess Louise were an exception, being loaded heavily and had to be thinned.

Our pear crop was the largest we have had, and some of the varieties extra size, selling all the way from $3 to $8 per barrel, which with the heavy crop proved quite profitable.

We adopted clean cultivation last year throughout our fruiting orchard and grew hoed crops among the young orchard after manuring with stable manure. The half acre devoted to crimson clover which was sown June 28, made a growth of about 12 inches and was turned under this fall the land being as loose as could be desired.

Although the young trees where the corn and roots were, made quite as good growth as those where the clover process was used.

All the young trees made a very satisfactory growth, 8 apples and ten pears had a few samples most of which were fine and well coloured.

The winter of 1898 was not a severe one, although from 28th March to 4th April, it was very cold and windy the thermometer getting down to 30 below on the 3rd April, but as there had not been much warm weather previous to that date the buds had not started and little damage was done. Fruit trees in general were a week later in blooming than usual. About 6 weeks of July and August was very dry and hot and fruit ripened too rapidly ; then on 1st September, we had a 12 hours soaking rain which gave the apples and pears a vigorous start and they rapidly increased in size till picking time.

The conclusions I have arrived at are in favor of severe thinning of young wood, early and regular spraying with Bordeaux during the growing season, severe thinning of overbearing varieties, and lastly plenty of manure and ashes where available and phosphates where manure cannot be obtained.

If these few rules are observed carefully and attended to, the results will be a large crop of No. 1 fruit, and no other kind pays to grow.

Georgian Bay Station.

Fertilizer Experiments.—This experiment was tried on one-half acre of bearing plums. Soil, deep sandy loam, in perfect condition. About July 1st, 1897, I spread about thirty-five bushels of unleached ashes and one hundred pounds ground bone. On 12th July I sowed ten pounds red clover. It was nicely up by July 20th. It made a thick growth, from eight to twelve inches, with a very heavy growth of roots. Plowed under Nov. 23rd. Results : trees the following summer had a heavier and darker foliage, fruit rather larger, better color and more bloom.

In 1898 the same half acre was again treated the same way, except that twenty-five pounds of potash was used instead of ashes, and crimson clover in place of red. The season being dry, the clover was not sown quite so early as the previous year, and therefore did not make such a heavy growth as first season, but still was very good. The plowing under in this case was not done until early spring, 1899. Clover mostly winter killed. Results : this plot was quite the equal, if not better, than the adjoining orchard ; cultivated the same way and treated with ten tons of barnyard manure per acre.

Peaches.—We have about fifteen varieties in test. While none of the trees were entirely killed, the buds were either killed or weakened so much that only a few blossoms appeared. These nearly all fell off, without setting fruit.

Pears.—Until a few years ago, it was thought Flemish Beauty was about the only pear that could be successfully grown here, but now we find pears are succeeding nearly as well as apples and plums. This season we fruited successfully, Bartlett, Clairgeau, Belle Lucrative, Buffam, Beurre d' Anjou, Duchess, Clapp's Favorite, Howell, Vicar of Wakefield, Flemish Beauty, Idaho, etc., all nice and clean.

Insects and Fungi.—We were very little troubled with insects this season ; only with caterpillars and curculio in the spring. After spraying with Paris green and Bordeaux, we had no more trouble with them.

Shot hole fungus made its appearance about August, which caused the leaves to fall from trees not sprayed.

We have sprayed twice during the summer. The trees held a healthy foliage until frost, which, I think, proves the efficacy of Bordeaux mixture for leaf blight.

Niagara Station.

I beg to submit notes dealing with the various fruits, etc., at this station. The fruit crop of this district during the past season has been decidedly better than in 1898, and on the whole prices obtained by growers have been more remunerative. Elsewhere will be found paragraphs taking up the different fruits, diseases, etc., in detail, and chronicling in a condensed form the results of the past year.

Crimson Clover.—The past winter provided extremely adverse conditions for the success of this useful plant. Nevertheless, I believe that the contentions advanced in my report last year are substantially correct. Of the three patches there referred to, the first, that is in oat stubble, was about half killed ; the remaining half made a very fair growth, and by manuring the vacant spots an excellent crop of corn was secured from the ground this year. On the second and third patches mentioned enough clover was left to form a valuable green manure this season.

HARDY FRUITS.

Algoma Station.

On the 13th of May I received a box containing 19 varieties of apples, 3 of each kind ; 3 varieties apricots, 3 of each ; 12 varieties cherries, 3 of each ; 4 varieties pears, 3 of each ; 12 varieties plums, from one to three of each ; 7 varieties strawberries, 12 of each ; 11 varieties raspberries and blackberries, 12 of each ; 10 varieties grapes, 3 of each ; 5 varieties gooseberries, 12 of each ; 4 varieties currants, 12 of each.

The stock had been good and well packed, but delayed altogether too long in transit. The apples was in fairly good condition, the pears also. Of the strawberries I have managed to save one or two plants of each variety. The cherries, considering the condition they were in when planted, have done fairly well. Of the plums a few failed ; of apples I have lost one ; pears, all alive ; apricots, all dead ; grapes made a poor growth.

The whole, being for experimental purposes, were placed on a northwest slope ; ground in good condition and exposed to n.w. wind across the lake, my object being more particularly to test the hardiness of the different varieties rather than to see how tender a variety it was possible to grow. The ground has been in root crop and kept clear of weeds during the summer, thus making a growth of from 0 to 27 inches and mostly going into winter with well ripened wood. I have but little information to give in regard to the adaptability of different varieties for this section other than you already have.

I would say plant Charlemoff for a summer apple ; it is better every way than Yellow Transparent, then Duchess, to follow up to October, perhaps the best commercial apple we have if there is a market at short distance. I have made more money out of Duchess than any other kind—then several others come in. *e.g.*, St. Lawrence is showy and good ; Gideon also, which is not subject to decay at the core here ; then Wealthy, our grand stand-by for winter ; it has a few faults, but as yet we have got nothing to equal it—in a cold cellar it will keep until March ; Golden Russet is also coming into favor, but the tree will not stand neglect. I prefer Wealthy, which will grow anywhere and on any soil, and bear fruit every year.

Pears. I do not know of one satisfactory so far. Flemish Beauty is perhaps the best. Dwarfs are no good, it is throwing money and time away to buy and plant them.

Plums, I have little experience with here. Lombard, Shipper's Pride, Duane's Purple, I have seen canning more fruit that should have been left on the tree. I would not advise planting for other than home use at present.

Cherries seem to be an eccentric fruit, largely depending on the ground on which they are grown, but such as Richmond, Montmorency and Ostheim will likely succeed. Sweet cherries are in the experimental stages yet, although I have known Black Tartarian doing fairly well planted 11 years ago.

St. Lawrence Station.

Apples.—The following apple trees fruited a few specimens, most of them imperfect, so that I cannot give a true description of the fruit for this year.

Longfield. Planted 1896. Eight apples, undersized, ripened in October.

Ontario. Planted 1896. Six apples, undersized, well colored, stung by codling moth and curculio, although injured they give promise of keeping well.

McMahon White. Planted 1896. A few specimens stolen before reaching maturity.

Milwaukee. Planted 1896. One apple, size 3x4 inches ; form and color somewhat similar to its parent, the Duchess, and give promise of keeping well.

Switzer. Planted 1897. One apple, ripe early in September and was decayed early in October.

Excelsior Crab. Planted 1897. Three apples, size $1\frac{5}{8}$ x $1\frac{5}{8}$; ripe in August.

Hibernal. Planted 1896. Two apples. Poor in quality, color and size. Ripe in October.

Pears.—Pears have done very well with me this year, better than I expected considering the severe winter of '98-'99, with no snow for protection. I lost two trees this July past that showed signs of root killing, viz., one Howell and one Baba. No blight this year, and in most cases trees that showed blight last fall are recovering.

Keiffer's Hybrid. Planted 1896. Healthy, very vigorous bloom, and matured 45 pears, rather undersized but free from blemish. Harvested October 5th, very promising.

Bessemianka. Planted 1896. Healthy, vigorous bloom. One pear dropped before maturity.

Lincoln. Planted 1896. Healthy, vigorous ; some blight in 1898, but recovering.

Japan Golden Russet. Healthy and vigor, medium blossom, buds injured by frost. The fruit buds on this variety have been injured for two winters in succession and will probably never bear fruit, but it will possibly be desirable as an ornamental owing to its handsome glossy foliage.

PLUMS.—The fruit spurs on all varieties of the European class suffered from the low temperature and high winds of February last, but leaf buds and terminal wood came through all right. There was some bloom on Weaver, Forest Rose, Forest Garden and Hanover, but no fruit set.

PEACHES.—*Bokhara.* Planted 1897. In the winter of 1897-8 the three trees were protected by stooking corn stalks around them. They winter fairly well. In the winter of 1898-99 they were left unprotected and were killed outright. Result—not hardy in this section.

APRICOTS.—*Harris.* Planted 1898. Healthy and vigorous. Wintered without injury.

INSECTS.—FUNGI, AND SPRAYING FOR 1899 ON APPLE TREES.—Tent caterpillars and forest tent caterpillars were the worst ever known in this section. Whole orchards were stripped of every leaf and many sections of the forests as well. Other insects were not quite so numerous as usual but quite bad enough to injure any fruit that was left by the caterpillars. Fungi was seen on both fruit and foliage in unsprayed orchards.

The results of spraying were entirely satisfactory with me. The first two sprayings entirely destroyed the tent caterpillars and the subsequent sprayings kept the forest caterpillars from doing any damage.

1st spraying	May 3	Bordeaux mixture	Buds opening.
2nd "	" 12	" "	Blossoms opening.
3rd "	" 27	" "	" falling.
4th "	June 7	" "	
5th "	" 21	" "	
6th "	July 4	" "	

Results on four acres of Fameuse and Scarlet Pippin, 500 bbls. of apples, 95% free from spot. Fruit of large size and classed 80% 1st; nearly 20% good 2nds; and a few cider apples. Stock selling at $2.00 to $3.00 per bbl. for seconds and $3.25 to $4.00 for firsts.

Plums were very free from insects and fungi. There was some aphis in the spring which was controlled by spraying with tobacco water May 3rd and 5th. Shot hole fungus was not hurtful to the trees.

Pears were particularly free from slug or other insects, but were sprayed with Bordeaux mixture in June to check the caterpillars.

CULTIVATION.—My bearing orchard of Fameuse and Scarlet Pippin was given frequent and thorough cultivation from early spring until the middle of July, at which time the land was sown to clover. Fertilizers used bone meal and muriate of potash—200 of the former and 100 of the latter per acre.

In the experimental plot the land was planted to corn and potatoes and manured with stable manure.

All my fruit trees are in a healthy condition this fall and fruit buds well developed and ripened, but in orchards where the caterpillars destroyed the foliage in June the terminal shoots are all green yet and no fruit buds. A severe winter may prove fatal to many trees.

FRUIT GROWING IN THE NORTH.

A REPORT OF A VISIT OF INSPECTION MADE BY MR. A. M. SMITH IN NOVEMBER, 1899.

Having visited several of our northern districts during the past season with a view to ascertaining what fruits, if any, could be grown with profit to the settlers there, I thought that perhaps some of my observations might be of general interest. I find that settlers in nearly all the settlements in Muskoka, Parry Sound, Nipissing and Algoma Districts have tried growing fruit of some kind to a greater or less extent; but the majority of them have failed, simply for the reason that they did not know what varieties were adapted to their climate. Many of them, coming from Southern and Western Ontario, longed for the fruit that they had been accustomed to there, and planted Baldwin, Greening, Spitzenberg and other tender apples, sweet cherries, plums and pears, etc. Many of these were too tender north of Lake Ontario, and of course failed to grow, and they were discouraged. Others were induced by tree agents to try iron-clad varieties (so called) that would stand the climate of the Klondike, and paid exhorbitant prices, only to find themselves swindled, and were of course disgusted and gave up. Occasionally settlers in different parts secured hardy crabs and perhaps a few Yellow Transparent, Duchess of Oldenburg, Wealthy, Longfield and other hardy apples; Early Richmond, Ostheim and some other hardy cherries, and, by caring for them, have secured fair crops, thus demonstrating that these fruits can be successsully grown in most districts. The past fall I visited St. Joseph's Island, in Algoma, and vicinity, and examined orchards over quite a large extent of country to see what effect the extreme cold of last winter had upon the different varieties—the thermometer was for several days 40 degrees below zero there.

Among those I examined I did not find one of the following :—Yellow Transparent, Duchess of Oldenburg, Wealthy, Gideon, Longfield, Alexander, Pewaukee, Scott's Winter, that appeared to be injured in the least, and most of them had borne good crops of fruit ; besides several Russian sorts and local apples, the names of which were unknown.

There was one variety there that appeared to be especially hardy and was called Charlamoff, though the fruit was all gone when I got there. It was described as a beautiful striped and mottled red apple about the size of the Duchess, a little earlier and of much better quality for eating. Besides apples, I found several varieties of cherries, including early Richmond, Ostheim and other Russian sorts uninjured, and a few pears and plums. Among the latter, to my surprise, was the Abundance, which I had always supposed would not succeed far out of the peach belt ; but here it was, and I was credibly informed had borne several crops of fruit in this district. I also found a peculiarly hardy pear tree, name unknown, which had stood the winter, borne fruit and made an immense growth. It was procured in Iowa, and described as a medium size, early pear of good quality. The Flemish Beauty and Clapp's Favorite had also stood the winter fairly well. Besides those mentioned as uninjured there were several varieties which were slightly injured and had borne considerable fruit in the past, such as Ben Davis, American Golden Russet, Wagner, Snow, Princess Louise and others.

In regard to small fruits such as strawberries, raspberries, gooseberries, currants, etç., they can be grown, I believe, even in greater perfection than farther south, as the great depth of snow in the winter protects them. Also many kinds of early grapes, that ripen before frosts, can be grown by laying down the vines in winter.

But with very few exceptions there is a great want of care of trees among the early settlers. They do not seem to understand that in order to have them succeed they need cultivation as much as any other crop, and many of their failures are simply from neglect

I did not see any San Jose Scale in my travels, but I saw more oyster-shell bark louse in one day than I ever saw in my life before. I visited the new Fruit Experimental Station established by the Government at Richard's Landing, under the supervision ot Mr. Charles Young, and was well pleased with the thorough and systematic manner in which he has taken hold of the work. He has already quite a variety of fruits in bearing of his own, and when those sent him by Government mature he will be able to give planters information in regard to what to plant that will be of great value to them. I believe if such an institution had been established there fifteen years ago it would have saved thousands of dollars to that part of the country, as thousands of dollars' worth of trees are planted every year, one-half of which will never bear fruit and will be a bill of expense to the purchaser in planting and caring for them.

I have a small experimental station of my own at Powassan, in the Parry Sound District, planted a year ago last spring, and I have found the same varieties stand the winter there that did at St. Joseph's Island under about the same temperature. I found there, as here, that frequently trees are injured by the early rising of the sap on the sunny side of the tree, particularly where there is no frost in the ground, and then freezing and bursting of the bark. This, I think, could be obviated in a measure by protecting the trunks with peeled basswood or other bark or building paper wrapped around them. In conclusion, I would like to offer a little advice to northern planters, which may also be good for other sections—don't plant a tree unless you *intend* to take care of it. Secondly, carry out your *intentions.* Don't plant a tree unless you have better evidence than a tree agent's word that it will succeed in your locality. If you don't know what is best for your section enquire of the nearest fruit experimental station, or the secretary of the Fruit Growers' Association of Ontario. It is his business to answer you.

When you have decided what to plant send to some reliable nurseryman and get your stock direct from him if possible. Plant bountifully and carefully, and cultivate thoroughly until past midsummer each year, to induce an early growth, and then only enough to keep down weeds and let the wood harden up to stand the winter. Protect from insects, mice and cattle. Use common sense and diligence, and there is scarcely a farmer in Ontario who could not raise fruit enough of some kind to supply his own table. There is many a one on the great water-way to the North-west, along the shores of St. Joseph and Manitoulin Islands who might get rich in growing Duchess of Oldenburg, Wealthy and other hardy apples for the northern markets.

APPLES.—Yield and selling price of varieties at Simcoe Statioı , 1899.

Varieties.	Age.	Time of blooming.	Date of maturity.	Date of gathering.	Yield.	Grade per cent. Class 1.	Class 2.	Class 3.	Average price.	Remarks. On conditions of cultivation, spraying, manuring, etc.
Alexander..........	7 years	May 13.....	October	Oct. 15....	3 barrels....	95	5	......	1 75	Top grafted on T. sweet, 7 years old.
Ben Davis........	18 "	June 1.....	May	Oct. 27....	2 "	90	10	......	2 00	
Fameuse	22 "	May 15.....	December ...	Sep. 29....	4 "	75	25	......	2 00	
Golden Russet......	17 to 22 years	May	April	Oct. 15 to 27	av. of 50 trees. 2 barrels....	80	20	......	2 00	
Hurlburt	18 years	May	January	Oct. 15....	1½ "	90	10	......	2 00	
Kean's Seedling ...	8 "	May	October	Sep. 20....	½ "	95	5	......	1 75	Top grafted.
King	24 "	May	February....	Oct. 2....	½ "	90	10	......	2 50	" poor bearer.
La Rue	22 "	June 1	February....	Sep. 30....	2 "	80	20	......	2 00	
Mann	12 "	May	May	Oct. 14....	1 "	95	05	......	2 25	A fine keeper.
Northern Spy	18 "	June 1	April	Oct. 28....	2½ "	85	10	05	2 50	The most valuable apple grown here.
Oldenburg (Duchess)	20 "	May 19......	September ..	Aug., Sept.	3 "	95	05	......	1 40	
Pewaukee	12 "	May	March	Oct. 1....	2½ "	90	10	......	2 25	
Ribston Pippin	8 "	May	January	Oct. 1....	1 "	90	10	......	1 75	Top graft.
Spitzenberg	22 "	May	April	Oct, 20....	2 "	85	10	05	2 25	
Tallman Sweet.	22 "	May........	April	Oct. 20....	3 "	90	10	......	1 75	
Wealthy	13 "	May	December ...	Sep.	2 " ...	80	15	05	1 75	

BLACKBERRIES.—Yield and selling price of varieties at Burlington station, 1899.

Varieties.	Age.	Time of blooming.	Date of maturity.	Date of gathering (first and last).	Yield per hill, in quarts.	Average price per quart.	Remarks On conditions of cultivation, spraying, manuring, etc.
	Years.					Cents.	
Agawam	4	June 8	July 24	July 24—Aug. 10	1	8	
Ancient Briton	2	" 8	" 18	" 18— " 5	very few	....	
Child's Tree	2	" 8	" 17	" 17— " 6	"	....	
Dorchester	3	" 7	" 20	" 20— " 5	1/4	....	
Early Cluster	4	" 11	" 22	" 22— " 10	very few	....	
Early Harvest	4	" 11	" 10	" 10— " 1	2/3	9	
Early King	3	" 8	" 9	" 9— " 1	3/4	9	Prices were good.
Eldorado	3	" 6	" 20	" 20— " 5	2/3	....	The drouth was more severe here this season than even during 1898. The general crop was, therefore, very light, bushels of berries never reaching maturity. Not more than 50 per cent. of a full crop. The severe frost of February also destroyed a great many plants on low ground.
Erie	4	" 13	" 20	" 20— " 5	1/6	....	
Gainor	4	" 13	" 20	" 20— " 5	2/3	10	
Kittatinny	4	" 10	" 20	" 20— " 15	3/4	10	
Lovett's Best	4	" 11	" 27	" 27— " 10	very few	....	
Maxwell	4	" 11	" 17	" 17— " 1	"	....	
Minnewaski	2	" 10	" 22	" 22— " 5	"	....	
Ohmer	4	" 11	" 20	" 20— " 5	1/3	....	
Snyder	4	" 9	" 15	" 15— " 1	3/4	7	
Stone's Hardy	4	" 8	" 20	" 20— " 5	2/3	....	
Taylor	4	" 8	" 20	" 20— " 5	3/8	....	
Wachusetts	4	" 8	" 20	" 20— " 10	very few	....	
Western Triumph	4	" 6	" 20	" 20— " 5	1	8	
Wilson's Early	3	" 13	" 17	" 17— " 5	very few	....	
Wilson Junior	2	" 4	" 17	" 17— " 5	"	....	

BLACKBERRIES.—Burlington Station, 1899.

No.	Name.	Age.	Vigor.		Productiveness.		Season. First and last.	Remarks.
			Feet of growth.	Scale 1-10.	Yield in quarts per hill.	Scale 1-10.		
		Years.						
1	Agawam	4	6	9	1	10	July 24—Aug. 10	One of the best.
2	Ancient Briton	2	4	7	very few	5	" 18— " 5	
3	Child's Tree	2	4	7	"	5	" 17— " 6	
4	Dorchester	3	6	9	¼	6	" 20— " 5	
5	Early Cluster	4	6	9	very few	7	" 22— " 10	
6	Early Harvest	4	4	7	⅔	8	" 10— " 1	Both offer well.
7	Early King	3	4	7	¾	9	" 9— " 1	
8	Eldorado	3	5	8	⅔	8	" 20— " 5	
9	Erie	4	6	9	⅙	6	" 20 - " 5	
10	Gainor	4	6½	9	⅔	8	" 20— " 5	Very promising.
11	Kittatinny	4	7	10	¾	9	" 20— " 15	One of the best.
12	Lovett's Best	4	5	8	very few	5	" 27— " 10	
13	Maxwell	4	2½	5	"	5	" 17— " 1	Cane too weak.
14	Minnewaski	2	5	8	"	5	" 22— " 5	
15	Ohmer	4	6	9	⅓	7	" 20— " 5	
16	Snyder	4	4	7	¾	8	" 15— " 1	One of the best.
17	Stone's Hardy	4	4½	7	⅔	8	" 20— " 5	
18	Taylor	4	6	9	⅜	7	" 20— " 5	
19	Wachusetts	4	6	9	very few	5	" 20— " 10	
20	Western Triumph	4	6½	9	1	10	" 20— " 5	One of the best.
21	Wilson's Early	3	4	7	very few	5	" 17— " 5	
22	Wilson Junior	2	7	10	"	5	" 17— " 5	Canes too long and weak.

BLACKBERRIES.—Lake Huron Station.

Name.	Age.	Vigor. Scale 1-10.	Productiveness. Yield in quarts.	Season. First and last.
	Years.			
Agawam	2	7	5¾	Aug. 5 to 22
Ancient Briton	2	7	2¾	" 5 " 14
Eldorado	2	6	4¾	" 5 " 14
Gainor	2	5	1	" 5
Ohmer	3	5	¼	" 5
Rathbun	2	5	1	" 5 " 14
Snyder	2	9	3	" 5 " 14
Stone's Early	2	10	5¼	" 5 " 14
Stone's Hardy	3	7	3½	" 5 " 14
Wachusetts	2	4	4¾	" 5 " 12
Western Triumph	2	5	3¾	" 5 " 22

CHERRIES.—Vigor, Productiveness and Season at Grimsby Station, 1899.

Name.	Class.	Age.	Vigor. Inches of growth. June 16, 1899.	Vigor. Scale 1-10.	Productiveness. Yield in quarts.	Productiveness. Scale 1-10.	Season. First and last.	Remarks.
Abbesse		..	16	7	First fruit	..	July 8	Yellow flesh, sweet.
California Advance		2	8	1	First fruit	..		juicy.
Centennial		..	12	3		..	June 16	
Choisy	Duke	4	17	8	1 quart	..	June 21-July 12	Too tender for ship-
Cleveland	Heart	4	15	7	3 quarts	4		ment.
Coe	Heart	..		..		6	July 15-30	
Downer's Late		4		..	¼	..	July 5	Sweet, delicious.
Dyehouse		2	14	6	First fruit	..		
Eagle	Heart	.	16	7		..	June 28-July 5	
Early Purple		..	17	8		..		
Elkhorn	Bigarreau	..		..		..	July 1-15	
Elton	Heart	..	20	10		..	June 20-July 5	
Eugenie	Duke	4	17	8	6 quarts	..	June 20-July 10	Much resembles May
German Ostheim		2	8	1	First fruit	..		Duke.
Grenner Glas		2	8	1	First fruit	..		
Griotte du Nord		..		..		..		
Hortense	Duke	4	12	3	4 quarts	5	June 28-July 6	
Ida		.	16	..		..		
King's Amarelle		2	14	..	First fruit	..		Yellow flesh, juicy,
Knight	Heart	..		.		..	June 25-July 5	mild acid.
Late Duke	Duke	4		..	8 quarts	..	June 28-July 10	
Loveapple		..	12	3		..	July 8	White with red cheek
Lutovka		..	12	3	First fruit	..	July 8-15	tender, juicy and
Magnifique		..	'0	2		..	July 15	good flavor.
May Duke	Duke	4	14	6	8 quarts	..	June 21-July 6	
Mezel	Bigarreau	..		6		..	June 25-July 5	
Montmorency	Kentish	..	10	2		..		
Morello	"	4	10	2	6 quarts	..	July 15-30	
Murdoch Bigarreau		..	16	7		..		
Napoleon	Bigarreau	..	17	8		10	June 25-30	
Ohio Beauty	Heart	4	14	6	4 quarts	..	June 28-July 5	
Olivet		4	12	3	2 quarts	..	July 1-15	
Oranien Kirsch		..	15	6		..		
Plymouth	Heart	2	10	3	First fruit	..		Red, delicious, sweet.
Purity		3		..	3 quarts	9	July 5-15	Very dark red, im-
Red May		..	12	3		..		mense load, very
Richmond	Kentish}	..	12	3		..	June 15-July	small, tart.
Rockport	Bigarreau	..	20	10		..		
Royal Duke	Duke	2	8	1	First fruit	..		
"	"	4		..	6 quarts	..		
"Schmidt"	Bigarreau	2	22	10	First fruit	..	July 10-20	Fine looking, very
Shatten Amarelle		..	8	1	First fruit	..		large, black almost
Sklenka		1	6	1	First fruit	..		tender.
Spanish	Bigarreau	..	22	10		..	June 28-July 5	
Spate Amarelle	Kentish	1	10	2	First fruit	..	July 10	Bitter when imma-
Strauss Weichsel		1	10	2	First fruit	..		ture.
Suda		1	12	3	First fruit	..		Inferior to Montmor-
Tartarian	Heart	1	18	9		..	June 16-30	ency.
Windsor	Bigarreau	..		8		..		Shows a tendency to rot but superior to
Wood	Heart	..	18	9		..	June 16	Elkhorn.
Wragg	Morello	..	10	2		10	July 15-30	Takes lead in productiveness and in early fruiting.

CURRANTS.—Tested at Burlington Station, 1899

No.	Name.	Planted.	Vigor. Inches of Growth.	Vigor. Scale 1-10.	Per Bush. Productiveness. Yield in quarts.	Per Bush. Productiveness. Scale 1-10.	Season. First and Last.	Remarks.
1	Belle de St. Giles...	1896	6	7	2	5	July 7-30........	Large berry but poor cropper.
2	Black Victoria	"	8	9	2⅓	6	July 9-31.........	
3	Brayley's Seedling..	"	6	7	3	8	July 9-31.........	
4	Champion...........	1895	9	10	2⅓	6	July 25-Aug. 15...	Rather too woody.
5	Cherry..	1896	7	8	4	10	July 6-30	One of the best
6	Collin's Prolific.....	"	9	10	2	5	July 20-Aug. 10..	Too much wood.
7	Fay's Prolific.......	"	5	6	2	5	July 8-31.........	
8	Lee's Prolific.......	"	7	8	3½	9	July 12-31........	
9	Naples......	1895	8	9	3⅓	8	July 12-31........	One of the best.
10	New Victoria........	1897	6	7	1	3	July 5-28.........	
11	North Star.........	1896	6	7	1½	4	July 8-31.........	
12	Pomona.............	1897	6	7	½	2	July 9-31.........	
13	Raby Castle........	1896	7	8	4	10	July 8-31...	One of the best.
14	Red Cross..........	"	6	7	3	8	July 8-31.........	
15	Red Dutch.........	1897	7	8	1½	4	July 5-28...	
16	Red Victoria.... ..	1896	7	8	4	10	July 8-31.........	Very promising.
17	Saunders...........	1897	8	9	1½	4	July 12-31........	
18	Versailles	1896	6	7	2	5	July 6 27.........	
19	White Grape..	"	7	8	3½	8	July 8-31...... ..	Very large berry.
20	White Imperial	"	7	8	2½	6	July 8-31.........	
21	Wilder	"	7	8	4	10	July 8-31.........	Very promising.

CURRANTS.—Yield and Selling Price of Varieties at Burlington Station, 1899.

Varieties.	Age.	Time of Blooming. Full.	Date of Maturity.	Date of Gathering Berries. First and last.	Yield per bush, in quarts.	Average Price.	Remarks. On conditions of cultivation, spraying, manuring, etc.
Belle de St. Giles...	3 years	May 9	July 7	July 7-30........	2	Red Currants, 5c per quart, Black, 7c.	Red and Black Currants were an exceptionally fine crop, both in quality and quantity. Prices, too, were well maintained, and left a fair margin of profit. Good clean cultivation, sprayed with hellebore, and used stable manure and "Thomas" phosphate.
Black Victoria......	3 "	15	9	9-31........	2⅓		
Brayley's Seedling..	3 "	12	9	9-31........	3		
Champion	4 "	16	25	25-Aug. 15..	2⅓		
Cherry.	3 "	9	6	6-30	4		
Collin's Prolific.....	3 "	16	20	20-Aug. 10..	2		
Fay's Prolific.......	3 "	12	8	8 31........	2		
Lee's Prolific.......	3 "	16	12	12-31	3½		
Naples	4 "	16	12	12-31	3⅓		
New Victoria..	2 "	10	5	5-28	1		
North Star...... ..	3 "	9	8	8-31........	1½		
Pomona	2 "	11	9	9-31	½		
Raby Castle........	3 "	8	8	8-31........	4		
Red Cross	3 "	8	8	8-31........	3		
Red Dutch........	2 "	10	5	5-28........	1½		
Red Victoria.......	3 "	9	8	8-31.......	4		
Saunders.	2 "	16	12	12-31.... ..	1½		
Versailles	3 "	9	6	6-27........	2		
White Grape.	3 "	10	8	8 31........	3½		
White Imperial ...	3 "	9	8	8 31........	2½		
Wilder...........	3 "	9	8	8-31.......	4		

GOOSEBERRIES.—Vigor, productiveness and season at Gooseberry sub-station, 1899.

No.	Varieties.	Age.	Vigor. Inches of growth	Vigor. Scale, 1 to 10.	Productiveness. Yield in quarts.	Productiveness. Scale, 1 to 10.	Season. First and last.	Remarks.
1	Autocrat	9	12	8	4	8	July 10 to 25	This is the only large variety that has given three consecutive crops.
2	Champion	6	15	10	6	10	June 20 to 30	
3	Chatauqua	5	8	7	3	7	July 5 to 20	
4	Carne's Golden	5	5	5	1	5	" 5 to 15	
5	Crosby's Seedling	5	12	8	3	8	" 10 to 25	
6	Crown Bob	5	6	7	2	6	" 10 to 25	
7	Columbus	5	12	8	4	8	" 10 to 25	
8	Cook's Eagle	3	4	5	1	5	" 10 to 25	
9	Downing	13	12	8	5	9	" 20 Aug. 5	
10	Dominion	3	10	7	2	6	" 10 to 25	
11	Golden Prolific	4	5	5	1	5	" 10 to 25	
12	Green Chisel	3	5	5	1	5	" 20 to 30	
13	Ingram's Ocean	3	5	5	1	5	" 20 to 30	
14	Keepsake	3	...	....	.....	......	....	
15	Lancashire Lad	3	5	5	1	5	" 5 to 20	
16	Large Golden Prolific	4	12	8	4	8	" 10 to 20	
17	London	3	5	5	1	5	" 10 to 15	
18	Lanceolot	3	5	5	1	5	" 10 to 15	
19	Mrs. Whittaker	3	10	7	3	7	" 15 to 20	
20	Oregon Jumbo	4	15	10	5	9	....	
21	Ontario	4	12	8	4	8	" 20 to 25	Very promising.
22	Pearl	7	13	9	6	10	" 20 Aug. 5	
23	Phœnix	4	8	7	1	5	" 15 to 20	
24	Queen	5	8	7	3	7	" 20 to 25	
25	Red Jacket	4	15	10	5	9	" 20 to 30	
26	Red Champagne	3	5	5	1	5	" 15 to 20	
27	Success	3	12	8	5	9	" 20 Aug. 5	
28	Triumph	5	8	7	3	7	" 15 to 20	
29	Whitesmith	7	12	8	4	8	" 20 to 25	
30	White Crystal	6	13	9	6	10	" 20 to 30	
31	Whinham's Industry	7	5	5	1	5	" 20 to 30	
32	Yellow Scotch	4	12	8	3	7	" 25 to 30	

GRAPES.—Yield and selling price of varieties at Wentworth Station, 1899.

Varieties.	Age.	Thinning—per cent by hand or accident.	Date of maturity.	Date of gathering, (berries, first and last.)	Yield.	Grade. Per cent. Class 1.	Grade. Per cent. Class 2.	Grade. Per cent. Class 3.	Storage. Average price.	Storage. Temperature.	Date of decay.	Average price	Remarks. On conditions of cultivation, spraying, manuring, etc.
	Years				lbs.				Cts.				
Agawam	12	Not thinned	Oct. 20	Oct. 25	19	..	We had no mildew, all picked as one grade, except a very few culls left on vine.	..	$2\frac{1}{2}$	All were sold about as soon as picked.	..	..	The cultivation, etc., has not been varied enough to make any perceptible difference. The season and natural condition of the soil and location appears to make a greater difference than cultivating or manuring.
Brilliant	4	"	Sept. 12	Sept. 12	11	..		..	2		..	..	
Black Delaware	4	"	" 15	" 20	$3\frac{1}{2}$	..		..	..		..	..	
Brighton	17	"	" 6	" 6	16	..		..	2		..	..	
Cambridge	4	"	" 6	" 12	$12\frac{1}{2}$	..		..	$1\frac{1}{2}$		..	..	
Colerain	4	"	" 6	" 12	10	..		..	$1\frac{1}{2}$		..	..	
Concord	25	"	" 12	" 20	$22\frac{1}{2}$	..		..	$1\frac{1}{2}$		..	..	
Catawba	16	"	Oct. 22	Oct. 25	20	..		..	$2\frac{1}{2}$		..	..	
Dr. Collier	4	"	Sept. 12	Sept. 12	$9\frac{1}{2}$	..		..	$1\frac{1}{2}$		..	..	
Delaware	25	"	" 5	" 12	$15\frac{1}{2}$	..		..	3		..	..	
Early Ohio	4	"	" 1	" 5	6	..		..	2		..	..	
Lindley	12	"	" 10	" 15	18	..		..	$2\frac{1}{2}$		..	..	
Moyer	13	"	" 5	" 8	$8\frac{1}{2}$	..		..	3		..	..	
Niagara	16	"	" 18	" 25	24	..		..	2		..	..	
Opal	3	"	Oct. 6	Oct. 6	11	..		..	$1\frac{1}{2}$		..	..	
Presley	3	"	Sept. 5	Sept. 5	$10\frac{1}{2}$	..		..	$1\frac{1}{2}$		..	..	
Rochester	3	"	" 12	" 12	7	..		..	$1\frac{1}{2}$		..	..	
Salem	17	"	Oct. 15	Oct. 20	$16\frac{1}{2}$	..		..	2		..	..	
Wilder	17	"	" 15	" 20	15	..		..	2		..	..	
Worden	17	"	Sept. 6	Sept. 11	16	..		..	2		..	..	
Watt	4	"	Oct. 18	Oct. 18	8	..		..	$1\frac{1}{2}$		..	..	

RASPBERRIES.—Tested by A. E Sherrington at Lake Huron Station.

Name.	Age.	Vigor. Inches of growth	Vigor. Scale 1 to 10.	Productiveness. Yield in Quarts.	Productiveness. Scale 1 to 10.	Season. First and last.	Remarks.
	Yrs.						
All Summer	3	26	4	3½	3	July 18 Aug. 1	Not worth growing
Brandywine	3	36	7	6¼	4	" 4 " 29	
Brinckle's Orange	3	24	4	2½	1	" 4 to 21	Not profitable.
Cuthbert	3	60	10	18	8	" 12 Aug. 9	
Caroline	5	45	8	25¾	9	" 10 " 5	Berry too soft.
Conrath	2	....	10	22½	9	" 10 to 27	A good one.
Columbia	5	......	7	5	4	" 18 Aug. 2	Not doing well.
Golden Queen	3	50	9	16¾	8	" 12 " 5	Best yellow berry.
Gregg	3	.....	9	4½	5	" 15 to 27	A little tender.
Gault	2	....	7	8	5	" 4 to 20	
Hilborn	3	...	10	15	8	" 10 Aug. 1	The surest berry.
Hansell	3	36	6	8½	5	" 4 " 5	No good.
Kansas	3	......	9	22½	9	" 10 to 27	A good one.
Lovett	3	...	7	6½	4	" 6 to 27	
Lottie	3		7	10	6	" 10 to 27	
London	3	24	4	10	6	" 6 Aug 7	Lacks vigor.
Marlboro	3	24	4	11¼	7	" 6 " 5	
Miller	3	50	8	25¼	9	" 6 " 9	Doing well.
Mammoth Cluster	5	...	4	3	2	" 4 to 21	No good.
No Name	3	40	7	31¼	10	" 12 Aug. 9	A very fine berry But do not know the correct name.
Ohio	3	....	7	11¼	7	" 10 to 27	
Older	2	......	7	6¾	5	" 10 to 27	
Pioneer	3	......	6	9¾	6	" 6 to 27	
Progress	2	......	6	9¼	6	" 6 to 27	
Phœnix	3	40	8	22¼	9	" 12 Aug 9	A good late berry.
Reliance	3	36	6	11¾	6	" 4 to 31	Not vigorous enough.
Rancocas	3	30	4	5	4	" 6 to 29	Weak.
Red Field	3	......	8	8¼	5	" 12 to 27	No good
Shaffer	3	......	10	14¼	6	" 12 Aug. 2	Not good for market
Smith's Giant	3	......	10	10½	8	" 12 to 26	A good one.
Turner	3	45	8	24	9	" 4 to 31	Very hardy.
Taylor	3	......	8	16¾	7	" 4 to 19	
Thompson	3	40	7	13½	7	" 4 to 31	Doing very well.
White Champlain	3	24	4	1½	2	" 6 to 21	No good.
Zetler	3	40	8	10½	7	" 6 Aug. 5	A local berry.

PEARS.—Tested at Burlington Station, 1899.

Varieties.	Age.	Vigor. Inches of growth.	Vigor. Scale 1-10.	Season. First and last.
	Years.			
Anjou	19	10	4	Nov -Dec.
Bartlett	19	10	4	Sept.
Bartlett Seckel	1	10	4	....
Beurre Bosc	3	18	10	....
Beurre Giffard	3	18	10	....
Buffum	2	12	5	....
Clairgeau	3	12	5	Nov.
Clapp's Favorite	10	15	7	Aug.
Doyenne Boussock	3	16	8	Sept.
Duchess	10	10	4	Oct.-Nov.
Easter Beurre	3	15	7	....
Flemish Beauty	19	11	5	Sept.
Howell	3	16	8	Sept.-Oct.
Idaho	3	15	7	....
Josephine de Malines	3	16	8	....
Kieffer	3	18	10	Oct.-Nov.
Lawrence	3	20	10	Dec.
Lawson	3	18	9	....
Lincoln	2	20	10	....
Louise Bonne	2	12	6	Sept.
Osband's Summer	2	11	6	....
Petite Marguerite	3	20	10	Aug.
President Drouard	2	15	8	....
Seckel	2	12	6	....
Sheldon	10	12	6	Oct.-Nov.
Souvenir de Congres	3	15	8	Aug.-Sept.
Sudduth	2	12	6	....
Summer Doyenne	3	15	8	....
Tyson	2	18	9	....
Vermont Beauty	3	12	6	....
Wilder	3	18	9	....
Winter Nelis	3	12	6	Dec.

Very little blight or scab this year. A fair crop of clean, fine pears.

PEARS.—Yield and selling price of varieties at Burlington Station, 1899.

Varieties.	Age.	Time of blooming.	Date of Maturity.	Date of gathering.	Yield in quarts per tree.	Grade per cent. Class 1.	Class 2.	Class 3	Storage.	Average price.
Anjou	19 years	May 12	Nov.-Dec	Oct. 5	48	50	40	10	Packed in boxes and shipped when picked, to the Old Country some of the 1st class; the rest in barrels to Montreal; 2nd class in barrels to Montreal.	$3.50 per bbl. No. 1 and 2.
Bartlett	19 "	" 15	Sept	Sept. 1	64	45	35	20		$1.00 net per box No. 1; $3.00 per bbl. No. 2.
Clairgeau	3 "	" 15	Nov	Oct. 6	2	......	.....	......		
Clapp's Favorite	10 "	" 15	Aug	Aug. 20	32	70	30	......		50c per basket.
Duchess	10 "	" 11	Oct.-Nov	Oct. 1	16	50	35	15		$3.00 per bbl. No. 2; returns not in for boxes.
Flemish Beauty	19 "	" 15	Sept	Sept. 5	64	40	40	20		45c. per bskt.
Howell	3 "	" 14	Sept.-Oct	Oct. 1	2	....	......	......		
Kieffer	3 "	" 15	Oct.-Nov	Oct. 7	4	50	40	10		40c. per basket.
Lawrence	3 "	" 12	Dec	Oct. 15	1	......	......	......		
Petite Marguerite	3 "	" 15	Aug	Aug. 15	2	.....	...	......		
Sheldon	10 "	" 11	Oct.-Nov	Oct. 5	32	60	30	10		45c. per basket.
Winter Nelis	3 "	" 18	Dec	Oct. 15	1	.....	......	......		

PLUMS.—Tested at Lake Huron Station.

No.	Name.	Age.	Vigor.		Productiveness.		Remarks.
			Inches of growth.	Scale 1 to 10.	Yield in Quarts.	Scale 1 to 10.	
..	Abundance	4	36	9	12	8	Perfectly hardy.
..	Burbank	4	60	10	12	8	" "
..	Bradshaw	2	20	6	......	......	Not fruiting yet.
..	Coe's Golden Drop	3	30	8	......	......	" "
..	Duane's Purple	3	15	5	......	......	" "
..	Field	4	40	9	......	......	" "
..	Grand Duke	2	36	9	......	.....	Somewhat winter killed.
..	Hale	2	36	9	......	......	Not fruiting yet.
..	Imperial Gage	4	18	6	......	....	
..	Lombards	4	36	9	45	10	
..	Moore's Arctic	4	18	6	35	9	
..	Monarch	2	30	8	......	....	
..	Niagara	2	20	5	......	....	
..	Prince Englebert	3	36	9	....	......	
..	Quackenboss	3	30	8	......	......	
..	Spaulding	4	30	8	......	......	
..	Satsuma	2	60	10	......	......	
..	Shipper's Pride	4	50	9	.	......	
..	Victoria	4	18	6	......	......	
..	Wickson	2	36	9		......	Badly winter killed.
..	Yellow Egg	2	36	9	12	8	

RASPBERRIES —Tested at Burlington Station, 1899.

No.	Name.	Age.	Vigor.		Productiveness.		Season. First and last.	Remarks.
			Feet of growth.	Scale 1 to 10.	Yield in Quarts.	Scale 1 to 10.		
		Yrs.			p'r hill			
1	All Summer	4	3	5	3/4	7	July 8	Ripens until Oct.
2	Columbian	4	5½	9	1	9	" 10 to 31	
3	Conrath	2	3	5	1/4	3	" 8 to 30	
4	Cuthbert	4	6½	10	3/4	8	" 8 to 30	One of the best.
5	Gault	2	5½	9	1/2	5	" 8 to 30	
6	Golden Queen	4	5	8	5/8	7	" 8 to 30	
7	Gregg	3	5	8	1/2	6	" 10 to 31	
8	Hilborn	4	4	7	5/8	7	" 8 to 30	
9	Japan Wine	3	5	8	1/3	4	" 25	
10	Kansas	4	5½	9	1	9	" 3 to 24	Very promising.
11	Kenyon	3	3½	6	5/8	7	" 8 to 30	
12	Lotta	3	5	8	5/8	7	" 10 to 31	
13	Loudon	3	4½	8	1	9	" 8 to 30	Very promising.
14	Lovett	4	4	7	5/8	7	" 10 to 31	
15	Marlboro	4	3½	6	1 1/5	10	" 3 to 24	One of the best.
16	Miller	2	3	5	1	9	" 3 to 29	Very promising.
17	Mills	2	4½	8	5/8	7	" 9 to 20	
18	Ohio	3	6	9	[illegible]	8	" 10 to 31	
19	Older	4	5	8	[illegible]	8	" 3 to 24	Very promising.
20	Palmer	4	5	8	[illegible]	8	" 3 to 29	
21	Phœnix	2	3	5	[illegible]	7	" 10 to 31	
22	Progress	4	4½	8	1/2	5	" 3 to 24	
23	Redfield	3	4	8	[illegible]	7	" 10 to 31	
24	Reliance	3	3½	6	[illegible]	8	" 3 to 24	
25	Royal Church	2	7	10	[illegible]	7	" 10 to 31	
26	Shaffer's Colossal	4	5	8	[illegible]	7	" 10 to 31	
27	Smith's Giant	3	6½	10	[illegible]	8	" 13 to 31	
28	Souhegan	3	3½	6	[illegible]	7	" 8 to 31	
29	Thompson	4	3	5	[illegible]	6	" 3 to 24	
30	Winant	2	2½	4	1/4	3	" 13 to 30	

ANNUAL REPORT

OF THE

SUPERINTENDENT OF SPRAYING

FOR

ONTARIO

1899

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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1900.

REPORT

OF THE

SUPERINTENDENT OF EXPERIMENTAL SPRAYING.

1899.

To the Honorable John Dryden, Minister of Agriculture for Ontario :

I am able to report that the Experimental Spraying of fruit trees, which has been conducted by the Department of Agriculture during the past five years, has again been productive of satisfactory results, both in attendance and in the results obtained in the different orchards, as may be seen by examining the record of sprayings. As in former years, the work was done regularly at thirty points scattered over the Province. It was intended to reduce the number of stations, but requests for the work were so urgent that it was found impossible. In addition to this an extra man had to be sent a couple of trips to a point which could not be included in the regular routes.

The territory was divided into three routes :—Mr. Jos. McPherson taking the Western, Mr. T. A. Walker the Central and Mr. J. B. Pettit the Eastern.

Each orchard was visited six or seven times.

One solution was used for all the applications—Bordeaux mixture, according to the following formula :

Copper sulphate	4 pounds
Fresh lime	4 pounds
Water	40 gallons

To this was added in every case 4 ounces of Paris green.

The following plan of spraying was followed as closely as possible :

First spraying : When the buds are swelling.

Second spraying : Just before the blossoms open.

Third spraying : When the blossoms have fallen.

Spraying at intervals of about twelve days until the danger of scab is past.

The attendance was largely in excess of any previous year.

In 1896 the attendance was 1,833; in 1897, 2,801; in 1898, 3,538; in 1899, 4,618.

This growing attendance illustrates the increased interest being taken in the work. Last spring it was impossible to respond to all the requests for stations, and at the close of the season this year there are 65 applications for the work on file.

Systematic spraying is being taken up all over the country in the wake of the experimental work, nor is this the only beneficial result of the Government's efforts, for now that the people's attention has been drawn to the unsatisfactory condition and results obtained from their orchards and the causes for the same, a general cleaning up and improvement is noticeable.

A good object lesson of the results of spraying was given at the Industrial Exhibition at Toronto. The owners of orchards where experimental work was done were invited to select and forward samples of sprayed and unsprayed fruit of the same varieties which would fairly represent the results of the work. The following gentlemen responded and supplied fruit as requested : Messrs. J. Mogk, Tavistock ; D. M. Halliday, Chesley ; R. Johnston, Havelock ; J. Crawford, Bethel ; G. Lambert, Thornbury ; J. Elmhirst, Keene ; D. Snider, Elmira ; R. Hancy, Alliston ; A. H. Crosby, Markham ; John Dance, Wiarton ; A. Head, Milford ; J. Lewis, Mildmay ; H. McCormack, Paris ; D. Gellander, Wellington ; H. Wilson, Caledon East ; M. Harrison, Shelburne ; J. Ranton, Palmerston ; R. E. Hemphill, Listowel ; H. Martin, Clanbrassil ; J. Semple, Tottenham ; J. M. McNab, Southampton ; W. F. Weir, Prince Albert ; Jos. Sandy, Omemee. The contrast between the sprayed and unsprayed fruit was very striking. Some were incredulous and believed that the selections were not fairly made. An extract or two from letters received bears on this point. Mr. H. McCormick, Paris, writes :— "You will think some of the unsprayed ones are very uneven in size but I could not help it."

Mr. Jos. Sandy, Omemee, writes :—

"More contrast in appearance of the trees than in the fruit."

Mr. Jos. Ranton, Palmerston, writes :—

"I was afraid to send an honest exhibit for fear the people would not believe it possible to secure such results."

Probably the most striking contrast, and the one most criticized, was in the exhibit of Mr. J. Dance, Wiarton, but an inspection of his orchard fully justified the selection.

I have to thank the public press for many courtesies in publishing notices and results of meetings, and for many favorable notices of the work.

There are men throughout the Province who are keeping their orchards free from tent-caterpillars and canker worms; but they complain that their neighbors do not, and that they suffer from this neglect. The same complaint applies to the codling moth, especially in the Southern sections of the Province, and the case is more serious as there are several broods of codling moth in a season. A large part of the land in that section is devoted to fruit growing, so that one orchard is easily infested from another. Many fruit growers think that we should have legislation compelling all owners of orchards to keep them free from tent-caterpillar, canker worm and codling moth. The Ontario Fruit Growers' Association has decided to ask for amendments to the "Yellow and Black Knot Act," making it applicable to the spraying and bandaging of apple and pear trees for the destruction of the codling moth. The buyers appreciate more than ever the advantages to be derived from handling sprayed fruit, and I do not know of a single buyer who is not now an advocate of spraying.

Some years ago the claim was made that sprayed fruit was larger, cleaner, better colored, better flavored and that it possessed better shipping and keeping qualities than unsprayed fruit. This was a sweeping claim certainly, but one which has been fully proven by the records of experimental work.

One gentleman told me that he had in one shipment to Britain, this fall, both sprayed and unsprayed apples. The sprayed arrived in splendid condition and brought satisfactory prices, only one barrel being slack. The unsprayed fruit was reported slack, wet and wasty and did not pay the freight. This was especially gratifying, as he was not inclined previously to favor spraying.

One of the largest growers and most extensive shippers in Ontario, who until this season would have nothing to do with spraying, told me recently that he had made up his mind that he would have to adopt spraying or give up growing.

Following is a record of sprayings, giving, 1st, Agents' notes as the work was done, 2nd, Results ascertained by myself on inspecting the orchards in the fall, and 3rd, Letters from the owners of the orchards stating their opinions of the results in their orchards.

W. M. Orr, Superintendent.

Fruitland, Jan. 2d, 1900.

RECORD OF SPRAYINGS.

Thornbury, Grey Co.—Mr. Geo. Lambert's Orchard.

1st application, May 4th.—Fine, buds not fully open yet; great numbers of aphis and tent-caterpillar; trees otherwise healthy.

2nd application, May 17th—Could not spray on account of rain.

3rd application, May 31st.—Threatening rain; blossoms have just fallen; trees look well.

4th application, June 12th.—Threatening rain; the havoc of the tent-caterpillar in many orchards in this part of the country is dreadful.

5th application, June 27th.—Fine; the trees and apples in our plot are in first-class shape.

6th application, July 11th.—Fine; foliage and fruit on sprayed trees very superior to that on the unsprayed trees.

I inspected Mr. Lambert's orchard and found the following results:

King,—Sprayed, 89 per cent. clean. This tree is 23 years old and gives its first clean fruit this year.

Canada Red.—Sprayed, 93 per cent. clean, heavy load; unsprayed, 20 per cent. clean, most the fruit dropped off.

Snow.—Sprayed, 84 per cent. clean; unsprayed, 4 per cent. clean.

Greening.—Sprayed, 92 per cent. clean; unsprayed, 4 per cent. clean.

Astrachan.—Sprayed, 99 per cent. clean; unsprayed, 50 per cent clean.

Cayuga Red Streak.—Sprayed, 88 per cent. clean; unsprayed, 57 per cent. clean.

Spy.—Sprayed, 96 per cent. clean; unsprayed, 18 per cent. clean.

Alexander.—Sprayed, 85 per cent. clean; always scabbed before.

Irish Peach.—Sprayed, 75 per cent. clean; never fit for use before.

On Nov. 23rd Mr. Lambert writes:—

"With great pleasure I write the results of the Government spraying in my orchard this season. In the spring when the agent came upon the scene my orchard was infested with all all kinds of insects, especially the forest tent-caterpillar. At the first application the pest was checked, and the general tone of the orchard was good, foliage good and fruit mostly set well. In gathering and packing every variety sprayed showed a marked advantage, scarcely any scale and much less codling moth than on the unsprayed trees.

In all the varieties sprayed I would say there was an average of 80 per cent. to 90 per cent. of clean fruit. I feel convinced that spraying properly done will pay better than any work on the farm.

STAYNER, SIMCOE CO.—MR. L. A. PATERSON'S ORCHARD.

1st application, May 5th—Fine, tent-caterpillars very numerous; this is a fairly good orchard, but is rather old and needs scraping and pruning.

2nd application, May 18th—Unsettled; about half of the trees were in full bloom and could not be sprayed; there are tent caterpillars and canker worm on the unsprayed trees, but the sprayed trees are clean.

3rd application, June 1st—Fine; apples will be a light crop here.

4th application, June 14th—Rained all the afternoon.

5th application, June 28th—Rained all day. Mr. Paterson will spray when it clears.

6th application, July 12th—Fine; sprayed trees are almost free from spot and looking well.

I inspected Mr. Paterson's orchard and found the following results:

Spy.—Sprayed, 76 per cent. clean.

Snow.—Sprayed, 72 per cent. clean.

Greening.—Sprayed, 80 per cent. clean; unsprayed, 40 per cent. clean, dropped most of its fruit.

Baldwin.—Sprayed, 76 per cent. clean; unsprayed, 28 per cent. clean.

ALLISTON, SIMCOE CO.—MR. ROBT. HANCY'S ORCHARD.

After the first application in the orchard selected it was decided to have the work done in Mr. Hancy's orchard, as the one previously selected had very few varieties and was not bearing this year. On the second trip the day was wet and the trees in full bloom.

1st application, May 30th.—Threatening rain; bud moth and tent caterpillar bad in this locality.

2nd application, June 12th.—Sprayed after heavy rain; trees in very good shape; canker worm and tent-caterpillar very bad in unsprayed trees; many orchards have been completely stripped by them.

3rd application, June 26th.—Fair; this orchard fairly free from scab.

4th application, July 10th.—Fine; quite a noticeable difference between the sprayed and unsprayed trees.

This orchard is nearly all early fruit, and was harvested before I inspected the orchard. However, Mr. Hancy says the results were satifactory, about 80 per cent. of the sprayed fruit being clean, and the sprayed foliage in good condition. He also says that his snow apples are fit to use for the first time in many years.

On Nov. 27th, Mr. Hancy writes,—

"Regarding my orchard prior to spraying I may say that the fruit was getting worse every year,—small, misshapen and full of grubs—but this year, after spraying, there is a wonderful difference in the size and condition of the fruit, also in the leaves, which were large and healthy looking, while the trees I left unsprayed were worthless, fruit small and scabby, leaves curled and of a brown color. I am convinced if all fruit growers would spray, we would soon be rid of those pests."

TOTTENHAM, SIMCOE CO.—MR. JOHN SEMPLE'S ORCHARD.

1st application, May 2nd.—Fine; plenty of tent-caterpillar and aphis; these trees are not very large but are healthy looking; they stand in sod and should be pruned.

2nd application, May 15th.—Fair; a few of the trees could not be sprayed to-day as they were in full bloom.

3rd application, May 29th.—Very heavy rain immediately after spraying; tent-caterpillar and bud moth bad on unsprayed trees, but sprayed trees are clean.

4th application, June 10th—Fine; fruit is not setting well, probably on account of so much wet weather; canker worm is working on unsprayed trees.

5th application, June 24th.—Fine; sprayed trees looking well.

6th application, July 8th.—Threatening rain; a few codling moth at work and a little scab appearing; there will be very favorable results in this orchard.

I visited Mr. Semple's orchard and found the following results:—

King.—Sprayed, 80 per cent. clean; unsprayed, 40 per cent. clean; the unsprayed tree dropped its fruit badly.

Twenty Ounce Apple.—Sprayed, 89 per cent. clean; unsprayed, 68 per cent. clean.

Harvest.—Sprayed, 96 per cent. clean; no unsprayed Harvest.

Spy.—Sprayed, 91 per cent. clean; unsprayed bloomed equally as well but matured no fruit.

Greening.—Sprayed, 92 per cent. clean; unsprayed, 16 per cent. clean.

On Nov. 27th, Mr. Semple writes:—

"If we intend growing apples we will have to spray our trees. I consider the trees that were sprayed had better fruit and fewer fallen apples. The sprayed trees would have 75 per cent. good fruit, and the unsprayed would average about that amount of wormy and imperfect fruit. When the apples were in the barrels you could plainly see the difference. The neighbors noticed I had seven Northern Spy trees, and the one that was sprayed had four barrels of apples, and the unsprayed ones had not a pailful on them. I do not know how to account for the difference. I have just sent you a few facts; you can use them as you see best.

TAVISTOCK, OXFORD CO.—MR. JOHN MOGK'S ORCHARD.

1st application, April 29th.—Fine; buds covered with aphis and some tent-caterpillar; this orchard is in sod and needs pruning and scraping; trees infested with oyster-shell bark louse, cigar case-bearer and apple-leaf bucculatrix.

2nd application, May 12th.—Fine. About one-half of the trees could not be sprayed, as they were in full bloom; in addition to insects previously mentioned bud moth doing some damage.

3rd application, May 26th.—Fine. Blossoms have just fallen.

4th application, June 8th.—Fair. Sprayed trees look well.

5th application, June 22nd.—Fine. A few green apple worms appearing.

6th application, July 6th.—Fine. A few codling moths and a little scab appearing; although the crop is not heavy in this orchard there is a very great contrast between the sprayed and unsprayed trees.

I inspected Mr. Mogk's orchard and found the following results :—

Maiden's Blush.—Sprayed, 83 per cent. clean; unsprayed, 52 per cent. clean.

Ben Davis.—Sprayed, 92 per cent. clean; unsprayed, 25 per cent. clean.

Blenheim Pippin.—Sprayed, 72 per cent. clean; unsprayed, no fruit.

Spy.—Sprayed, 80 per cent. clean, well loaded; unsprayed, no clean fruit.

Talman Sweet.—Sprayed, 88 per cent. clean; unsprayed, 20 per cent. clean. There are 88 trees in this orchard, and the sprayed trees are scattered all through it. Mr. Mogk says there is double as much good fruit on the twelve sprayed trees as on the other 76 trees.

" On Nov. 25th Mr. Mogk writes as follows :—

Out of 88 trees in my orchard 12 were sprayed 6 times at regular intervals and all summer the sprayed trees were easily discernible, even from a distance, by their greater quantity of rich green foliage. The trees sprayed were of the Northern Spy, Blenheim Pippin, Talman's Sweet, Ben Davis, Maiden's Blush, and the Snow apple varieties, and contained more good fruit for the market than all the others taken together, the fruit being cleaner and much less worm-stung. The Snow apple trees had but very few apples, but they had borne very heavily the two years before. All in all I am satisfied, and many others in my neighborhood also who observed the proceedings and effects, that spraying has most beneficial results."

CALEDON EAST, PEEL CO.—MR. HENRY WILSON'S ORCHARD.

1st application, May 6th.—Fine. The trees in this orchard are very old and high, stand in sod and are badly infested with tent caterpillar and aphis.

2nd application, May 19th.—Fine after a rain; could only spray four trees, the remainder being in full bloom; in addition to insects previously mentioned canker worm and bud moth at work.

3rd application, June 2nd.—Fine. Sprayed trees look well; tent-caterpillar still bad on unsprayed trees.

4nd application, June 15th.—Rained all day; trees were sprayed when it cleared on the 16th; fruit looking well but scarce.

5th application, June 29th.—Fine. Some green fruit worm and canker worm at work.

6th application, July 13th.—Fine. This is not a first-class orchard, but there is a noticeable difference between the sprayed and unsprayed trees.

I inspected Mr. Wilson's orchard and found the following results;

Snow.—Sprayed, 80 per cent. clean; unsprayed, 91 per cent. clean.

King.—Sprayed, 80 per cent. clean; unsprayed dropped its crop.

Greening—Sprayed, 84 per cent clean; unsprayed, 40 per cent. clean.

Seek-no-Further—Sprayed, 100 per cent. clean; unsprayed dropped its fruit.

Wagner.—Sprayed, 64 per cent. clean; no unsprayed fruit.

Mr. Wilson writes :—

"I would say that the trees that were sprayed were very much improved both in leaf and in fruit; so much so that it induced me to buy an outfit for my own use."

COPETOWN, WENTWORTH CO.—MR. A. HUGILL'S ORCHARD.

1st application, May 1st—Fine. Buds are beginning to open; tent-caterpillar and aphis at work; oyster-shell bark-louse bad; this is a fairly good orchard but it stands in sod and needs pruning and scraping.

2nd application, May 13th—Rain. Trees in full bloom; did not spray.

3rd application, May 27th—Unsettled. A few bud moth and tent-caterpillar at work but this orchard is not badly infested with insects.

4th application, June 29th—Fine. A few canker worm here; sprayed trees look well.

5th application, June 23rd—Fine. Some green fruit worm and bud moth seen to-day, also a little scab.

6th application, July 7th—Fine. Sprayed trees free from insects.

7th application, July 22nd—Fine. A very noticeable difference between the sprayed and unsprayed trees.

I inspected Mr. Hugill's orchard and found the following results :—

Baldwin.—Sprayed, 80 per cent. clean; unsprayed, 20 per cent. clean.

King.—Sprayed, 92 per cent. clean; unsprayed, 20 per cent clean, but very little fruit.

Spy.—Sprayed, 84 per cent. clean; unsprayed, 12 per cent. clean.

Greening.—Sprayed, 80 per cent. clean; unsprayed, no fruit.

Harvest.—Sprayed, 80 per cent. clean ; unsprayed, 40 per cent. clean.

Russet.—Sprayed, 92 per cent clean ; unsprayed, 40 per cent. clean.

Esopus Spitzenbergen.—Sprayed, 72 per cent. clean ; no unsprayed fruit.

Mr. Hugill writes :—

"When you were here you took a full report of the sprayed and unsprayed fruit. I think myself the spraying was very satisfactory, as the fruit was much cleaner."

PARIS, BRANT CO.—MR. H. MCCORMICK'S ORCHARD.

1st application, April 28th.—Threatening rain ; aphis and tent-caterpillar at work ; orchard in fairly good condition, but needs scraping and pruning ; on account of high wind could only spray from one side of the trees.

2nd application, May 11th—Sprayed immediately after a rain ; bud moth and tent-caterpillar very plentiful, also a few cigar case-bearers.

3rd application, May 25th.—Fine. Could not spray some varieties as they were in full bloom ; but caterpillar are on the unsprayed trees by thousands, while the sprayed trees are clean.

4th application, June 27th.—Sprayed after a heavy shower ; some apples both on sprayed and unsprayed trees are attacked by the green fruit worm.

5th application, June 22nd.—Fine. The sprayed foliage is looking very fine.

6th application, July 5th.—Fine. Sprayed trees clean and healthy.

7th application, July 19th.—Fine. There is not much scab, but codling moth is bad in this orchard.

I inspected Mr. McCormick's orchard and found the following results :—

Ontario.—Sprayed, 100 per cent. clean ; unsprayed, 9 per cent. clean ; the sprayed tree has a heavy crop while the unsprayed dropped most of its fruit.

St. Lawrence.—Sprayed, heavy crop about six barrels of first class fruit ; unsprayed, heavy crop, but none fit for use.

Spy.—Sprayed, 88 per cent. clean ; unsprayed 8 per cent. clean ; sprayed Spy well loaded with choice fruit ; unsprayed fruit almost worthless.

Greening.—Sprayed, 80 per cent. clean ; unsprayed 4 per cent. clean.

Talman's Sweet.—Sprayed, 84 per cent. clean ; unsprayed 40 per cent. clean.

Am. Golden Russet.—Sprayed, 60 per cent. clean ; unsprayed 12 per cent. clean ; most of the fruit has fallen from the unsprayed trees.

Baldwin.—Sprayed, 72 per cent. clean ; unsprayed 16 per cent. clean ; very few remaining on the tree.

On Nov. 4th Mr. McCormick writes :—

"Concerning the experimental spraying which was carried on in our orchard this summer I would say that it was a decided success. There were ten different varieties sprayed. The difference was most marked on the Spy, Greening and St. Lawrence. The fruit on the sprayed trees was large and clean, nearly free from worm, and was an average crop. On the unsprayed trees there was almost no fruit free from worms and scab. Throughout the season the foliage of the sprayed trees was abundant, while many of the others were completely stripped by caterpillars and other insects. I would recommend anyone who has an orchard to spray, and to do it thoroughly."

WATERFORD, NORFOLK CO.—DR. D. BOWLBY'S ORCHARD.

1st application, April 27th—Fine. Tent-caterpillar and aphis bad ; orchard in pasture ; trees require pruning and scraping.

2nd application, May 10th.—Fine. Blossoms opening ; caterpillars bad on unsprayed trees ; sprayed foliage looking bad.

3rd application, May 23rd.—Fine.

4th application, June 6th.—Fine. Fruit setting well on most trees ; a few canker worm and green apple worm.

5th application, June 20th.—Fine. The difference between the sprayed and unsprayed trees is very noticeable.

6th application, July 4th.—Fine. A few codling moth at work ; a little scab appearing.

I inspected Dr. Bowlby's orchard and found the following results :—

Greening.—Sprayed, 100 per cent. clean ; unsprayed, 44 per cent. clean.

Talman's Sweet.—Sprayed, 68 per cent. clean ; unsprayed, 16 per cent. clean.

King.—Sprayed, 80 per cent. clean ; unsprayed, 24 per cent. clean.

Baldwin.—Sprayed, 84 per cent. clean ; unsprayed, 36 per cent. clean.

Spy.—Sprayed, 88 per cent. clean ; unsprayed, 40 per cent. clean.

Esopus Spitzenberg.—Sprayed, 93 per cent. clean ; unsprayed, 24 per cent. clean. The fruit on the sprayed trees is from one-third to one-half larger than on the unsprayed trees ; the sprayed foliage is also in much better condition than the unsprayed.

Dr. B. says that the early apples which were sprayed gave about the same result as the Spy and Greening.

On Nov. 28th Dr. Bowlby writes :

"The foliage in my orchard for the last few years has not had a healthy look, the leaves blighting and turning yellow. This year on the trees that were sprayed the foliage was a dark green and did not drop off. The fruit showed a marked improvement both in size and having but very few spots."

CLANBRASSIL, HALDIMAND CO.—MR. HUGH MARTIN'S ORCHARD.

1st application, April 26th.—Fine. Trees need pruning and scraping.
2nd application, May 9th.—Fine. Blossoms beginning to open; this orchard is comparatively free from insect enemies.
3rd application, May 22nd.—Fine. Could not spray the Spys and Baldwins as they were in full bloom; a few tent-caterpillars, aphis and bud moth.
4th application, June 5th.—Fine. Green apple worm and canker worm at work.
5th application, June 19th.—Fine. Sprayed trees looking well and fruit setting well.
6th application, July 3rd.—Fine. Some codling moth and a little scab appearing.
7th application, July 18th.—Fine. Both sprayed and unsprayed trees are considerably infested with codling moth.

I inspected Mr. Martin's orchard Sept. 12th and found the following results :—

Spy—Sprayed, 50 per cent. clean ; unsprayed, 12 per cent. clean.

Talman's Sweet.—Sprayed, 70 per cent. clean ; unsprayed, 12 per cent. clean ; not many varieties bearing in this orchard this year ; fruit and foliage in good condition on sprayed trees.

PALMERSTON, WELLINGTON CO.—MR. JOS. RANTON'S ORCHARD.

1st application, April 27th.—Fine. Aphis and bark louse here; orchard in fairly good condition.
2nd application, May 10th.—Fine, followed by a heavy rain at night. Canker worm, tent-caterpillar and bud-moth at work on unsprayed trees.
3rd application, May 23rd.—Fine. Could not spray as trees were in full bloom.
4th application, June 6th.—Fine. This orchard is in good condition.
5th application, June 20th.—Fine. Green apple worm and apple leaf-roller here.
6th application, July 4th.—Fine, followed by showers in the evening. Codling moth appearing; fruit and foliage clean.
7th application, July 21st.—Fine after the rain. Trees in good condition and well loaded.

I inspected Mr. Ranton's orchard and found the following results ;—

Spy.—Sprayed, 96 per cent. clean ; unsprayed, 12 per cent. clean.

Snow.—Sprayed, 83 per cent. clean, heavy crop; unsprayed, 4 per cent. clean, light crop.

Ben Davis.—Sprayed, 88 per cent. clean ; unsprayed, 52 per cent. clean,

Cayuga Red Streak.—Sprayed, 92 per cent. clean ; unsprayed, 48 per cent. clean.

Astrachan—Sprayed, 75 per cent. clean ; unsprayed, 30 per cent. clean.

Colvert.—Sprayed, 88 per cent. clean ; unsprayed, 44 per cent. clean.

Russet.—Sprayed, 72 per cent. clean ; unsprayed, 76 per cent. clean.

This orchard is thirty or forty years old, stands in a new sod and is in fairly good condition. Mr. Ranton says he never sold over $10 worth of fruit from it in a year before. The crop last year was heavier than this.

Mr. Ranton writes :—

"Concerning the experimental spraying which was carried on in my orchard this summer, I would say the benefit derived from spraying is almost incredible. Last year I had not enough sound fruit for our own use, and this year, owing to the effects of spraying, we have enough for home use and sold forty barrels besides. I have 100 trees in my orchard and there are only 15 sprayed and two-thirds of the fruit was on the sprayed trees. The foliage of the trees showed green and healthy looking beside those not sprayed. As an evidence of my reliance on spraying I bought an outfit and every tree in my orchard will get the benefit next year."

ELMIRA, WATERLOO CO.—MR. DAVID SNIDER'S ORCHARD.

1st application, April 26th.—Fine. Buds just ready to open ; trees infested with apple-leaf bucculatrix.
2nd application, May 6th.—Fine. Found oyster-shell bark louse, aphis, bud moth and tent-caterpillar. Orchard in bad shape ; has not been plowed for eighteen years ; needs trimming and scraping ; leaf-roller very bad. The orchard bore heavily last year and will have but a light crop.
3rd application, May 22nd.—Cloudy and windy. Early varieties in full bloom.
4th application, June 5th.—Heavy rain both before and after spraying. Large patches of bark are loosening on the south-west side of many of the trees, more especially of the large ones. This is probably due to the severe frosts of last winter.
5th application, June 19th.—Fine. Green fruit worm doing some damage.
6th application, July 3rd.—Fine, followed by heavy rain at night. Codling moth at work. This orchard is in bad condition and is slowly dying.

I visited Mr. Snider's orchard and found the following results :—

Twenty Ounce Apple—Sprayed, 93 per cent. clean ; unsprayed, 28 per cent. clean.

Spy.—Sprayed, 80 per cent. clean ; unsprayed, 4 per cent. clean.

Spy and Twenty Ounce apple are the only varieties bearing this year.

Under date of Nov. 27th Mr. Snider writes :—

"Many of the trees we sprayed had no apples, but the Northern Spy was loaded and had very few wormy ones. The Twenty Ounce Pippins were the same. Could see no difference in the leaves. I believe it will do good if used at the right time.

SOUTHAMPTON, BRUCE CO.—MR. J. M. McNAB'S ORCHARD.

1st application, May 1st.—Fine. Buds on early varieties open, found here green aphis, woolly aphis, cigar case-bearer, bud moth, oyster-shell bark louse; orchard in good condition, well trimmed, but needs scraping.

2nd application, May 13th.—Cloudy, with appearance of rain; blossoms just opening. In addition to insects previously mentioned found canker worm, leaf-roller and tent-caterpillar.

3rd application, May 27th.—Rainy. Could not spray, as trees were in full bloom; wonderful difference between sprayed and unsprayed foliage.

4th application, June 9th.—Fine. Foliage on sprayed trees is perfectly clean, while that on the unsprayed is badly eaten by insects.

5th application, June 23rd.—Fine. Green apple worm doing some damage.

6th application, July 7th.—Rain in the morning, with appearance of more. Fruit clean and large.

7th application, July 19th.—Cloudy, followed by rain. Foliage in good condition; fruit clean and large; a few codling moth appearing.

I inspected Mr. McNab's orchard, and found the following results :—

Baldwin.—Sprayed, 80 per cent. clean; unsprayed, 52 per cent. clean.

Spy.—Sprayed, 80 per cent. clean; unsprayed, no clean fruit.

Greening.—Sprayed, 87 per cent. clean; unsprayed, no clean fruit.

Calvert and Baldwin—Unsprayed, heavily loaded, but no clean fruit.

This orchard stands in sod and is fairly well cared for. There are eighty trees, but Mr. McNab has never sold any apples for packing, and never more than $10 worth in any one year previous to this year.

Mr. McNab writes as follows :—

"The summer of 1899 was the first season my orchard was sprayed. The results were very marked. I would strongly recommend to all parties having orchards the benefits derived from spraying, the apples being much cleaner and finer in appearance, and the foliage remained green longer than previous years. I may also state that for the first time in my experience I sold my apple crop to buyers from a distance, thanks to spraying. Next year I hope to continue the spraying, and anticipate good results."

MILDMAY, BRUCE CO.—MR. JOS. LEWIS' ORCHARD.

1st application, April 29th.—Buds well advanced; leaves one-half inch long on some early varieties; found oyster-shell bark louse, cigar case-bearer, green aphis and woolly aphis. This orchard needs pruning and scraping.

2nd application, May 12th—Fine. Besides insects previously mentioned, find bud moth, canker worm and tent-caterpillar. Sprayed trees very free from insects.

3rd application, May 26th.—Rain ceased at two o'clock; sprayed at three; appearance of more rain. Spys in full bloom.

4th application, June 8th.—Fine. Green fruit worm and leaf-roller at work.

5th application, June 22nd.—Fine. This orchard is not in very good condition.

6th application, July 6th.—Fine. Sprayed fruit and foliage in good condition.

I inspected this orchard and found the following results :—

Spy.—Sprayed, 72 per cent. clean; unsprayed, 10 per cent. clean.

Baldwin.—Sprayed, 84 per cent. clean; unsprayed, 60 per cent. clean.

Talman's Sweet.—Sprayed, 86 per cent. clean; unsprayed, 38 per cent. clean.

On December 2nd Mr. Lewis writes :—

"Concerning the experimental spraying in my orchard this year, I would say that I think it is a great benefit, both to the trees and to the fruit. Throughout the season the foliage on the sprayed trees was a darker green color, was very much less injured by leaf-eating insects, and remained on longer than that of the unsprayed trees. On the unsprayed trees there was almost no fruit free from scab, very few being fit for market, while on the sprayed trees there was about 90 per cent of good fruit."

LISTOWEL, PERTH CO.—MR. ROBT. E. HEMPHILL'S ORCHARD.

1st application, April 28.—Fine, but windy. Buds beginning to open. Found oyster-shell bark louse and apple leaf bucculatrix. Some of the trees are forty feet high; they are poorly pruned and the trunks are whitewashed, but not scraped.

2nd application, May 11th.—Appearance of rain. Leaves about one and one-half inches in diameter canker worm, bud moth and leaf-roller at work.

3rd application, May 25th.—Windy, followed by two days' rain. In addition to insects previously mentioned aphis and tent-caterpillar at work.

4th application, June 7th.—Windy, followed by all night rain. Canker worm doing damage.

5th application, June 21st.—Fine. Green apple worm at work; the trees are looking well considering that they are very old.

6th application, July 5th.—Rain interfered just as we had started spraying. Mr. H. will spray when it clears.

7th application, July 21st.—Fine after raining in the morning; codling moth here in small numbers foliage in good condition; apples large and clean.

I inspected Mr. Hemphill's orchard and found the following results :—

Talman's Sweet.—Sprayed, 92 per cent. clean; unsprayed, 32 per cent. clean.

Spy —Sprayed, 92 per cent. clean ; unsprayed, set well but dropped its fruit.

Ribston Pippin.—Sprayed, 80 per cent. clean ; unsprayed, 60 per cent. clean.

Snow.—Sprayed, 93 per cent. clean ; no unsprayed snow trees. For years the snow apples in this orchard have been only fit for cider. There are sixty-six trees in this orchard ; all bloomed about equally, but the unsprayed trees have dropped nearly all their fruit. There will be about one hundred barrels of good fruit this year, three-fourths of which will be from the twenty sprayed trees.

Under date of Nov. 20th Mr. Hemphill writes :—

"I take this way of informing you and all whom this way concern that I am very much pleased that my orchard was chosen as a spraying station this year, as it has given me the largest kind of results. In 1896 the trees were in a most frightful condition. In 1897 I had very little fruit on any one tree that was not full of worms, and the trees were lousy and looked sick. In 1898 I had all kinds of fruit, but could not sell to buyers for shipment ; they were too scabby. This fall, after spraying twenty trees out of the sixty-seven, all good big trees, I had as high as eleven barrels of Spys off one tree, and for thirty-one barrels of the best sprayed fruit I received $1.00 per barrel more than was paid for any other apples in this district. The twenty trees sprayed brought me more money three times over than ever the orchard did before. The smallest number of apples gathered from any sprayed tree was four barrels, all good fruit. As to foliage, my trees are holding it yet. The trees that were not sprayed blossomed well, but by June or July the fruit and foliage dropped, so that when the time came for picking there was very little to pick. I picked one barrel off thirty-five unsprayed trees. My trees are very large and strong, but I found it necessary to place large ash poles as props under the sprayed trees. Others were as highly pleased with the results as myself. I cannot praise spraying too highly after this year's work in my own and other orchards."

Tara, Bruce Co.—Mr. W. J. Douglas' Orchard.

1st application, May 2nd.—Fine, leaves on early, varieties one-half inch long; orchard generally in bad shape, needs trimming and scraping; stands in a tough old sod, infested with green aphis, woolly aphis, tent-caterpillar, oyster-shell bark louse, canker worm, bud moth, etc.

2nd application, May 15th.—Cloudy, followed by three days' rain, blossoms already out on early varieties; there will be very little fruit.

3rd application, May 29th.—Rain both before and after spraying; tent-caterpillar is very bad, and as the sprayed and unsprayed trees interlace, they pass from one tree to another.

4th application, June 10th.—Fine. The leaves are all stripped from the unsprayed trees in this orchard and insects are crawling on the sprayed trees in large numbers.

5th application, June 24th.—Fine There are very few apples here ; the foliage on the sprayed trees is looking remarkably well considering the ordeal through which it passed.

6th application, July 8th.—Could not spray as it rained all day ; arranged to have the trees sprayed on the 10th.

I inspected Mr. Douglas' orchard and found the following results :—

Snow—Sprayed, 93 per cent. clean ; unsprayed, no clean fruit.

King—Sprayed, 93 per cent. clean ; no unsprayed trees.

Spy—Sprayed, 91 per cent. clean ; unsprayed, 4 per cent. clean.

There are 120 trees in this orchard from 20 to 35 years old. Apart from the sprayed trees there will not be one barrel of good fruit in the orchard.

Mr. Douglas writes—

"With regard to the orchard, it happened to be an exceedingly poor year for fruit, as I only had some seven or eight barrels altogether, but were nearly all clean fruit, owing to spraying. The foliage on the sprayed trees was very deep in color and healthy compared with those unsprayed. One snow-apple tree in particular had borne no fruit of any account for years, and then only fit for pig feed, on account of the scab ; but this year, thanks to spraying, there was a good crop on the tree, an increase in size and perfectly clean. My trees were very bad with the oyster-shell bark louse. I am convinced that we cannot under any consideration do without spraying."

Wiarton, Bruce Co.—Mr. John Dance's Orchard.

1st application, May 4th.—Fine but windy. Buds open on early varieties ; green and woolly aphis, tent-caterpillar, bud moth and oyster-shell bark louse in this orchard.

2nd application, May 17th.—Could not spray on account of rain ; blossoms just ready to open ; orchard needs pruning and scraping.

3rd application, May 31st.—Rained till two o'clock ; sprayed at three ; late varieties in full bloom ; tent-caterpillar very bad on unsprayed trees.

4th application, June 13th.—High wind followed by heavy rain at night.

5th application, June 27th.—Warm, followed by rain at night.

6th application, July 11th. Fine. Some codling moth appearing ; in spite of the unfavorable weather the trees are in good condition and the fruit large and clean.

On inspecting Mr. Dance's orchard I found the following results.

Snow—Sprayed, 92 per cent. clean.

California Russet—Sprayed, 92 per cent. clean ; unsprayed, 8 per cent. clean.

St. Lawrence—Sprayed, 92 per cent. clean ; unsprayed, no clean fruit.
Spy—Sprayed, 64 per cent. clean ; unsprayed, heavily loaded but not a clean apple.
Greening—Sprayed, 88 per cent. clean ; unsprayed, not a clean apple.
King—Sprayed, 68 per cent. clean ; unsprayed, equal bloom but dropped its fruit.
Astrachan—Sprayed, 70 per cent. clean ; unsprayed, 50 per cent. clean.
Strawberry Pippin—Sprayed, 88 per cent. clean ; unsprayed, 36 per cent. clean.
Talman's Sweet—Sprayed, 84 per cent. clean ; unsprayed, 20 per cent.
Unknown apple—Sprayed, 96 per cent. clean ; unsprayed, no clean fruit.
Crab-apple—Sprayed, heavy crop of good fruit, first in years.
Flemish Beauty Pear—Sprayed, 92 per cent. clean ; unsprayed, no clean fruit. These trees stand 15 feet apart and are both heavily loaded.

Mr. Dance says there are 100 trees in his orchard 25 years old, and that nine-tenths of the marketable fruit is on the 17 sprayed trees.

Under date of November 25th, Mr. Dance writes—

"The experimental spraying has proved very satisfactory. The California Russet that was sprayed was well loaded with good fruit, and the fruit on the unsprayed tree was not worth gathering. Out of ten Spys, two were sprayed and had more good fruit on them than the eight that were not sprayed. Out of six Snow trees, sprayed one, and it had more good fruit on it than the other five that were not sprayed. Other kinds about the same. There was very little good fruit except on the trees that were sprayed. Of two Flemish Beauty pear trees sprayed one was heavily loaded with very fine fruit ; on the unsprayed tree the fruit was spotted and cracked. All of the trees that were sprayed made a good growth and look healthy, and keep their leaves much longer than those that were not sprayed. Many who went through the orchard were surprised to see the difference between the sprayed and unsprayed trees. A few years ago we had very fine fruit, but last year I was afraid the orchard would soon be of little value to us. I hope, with proper spraying at the right time, we may again have good fruit and healthy trees."

Chesley, Bruce Co.—Mr. D. M. Halliday's Orchard.

1st application, May 3rd.—Fine. Leaves about three-fourths of an inch long ; trees are literally covered with tent-caterpillar and bud moth, also some aphis and oyster-shell-bark louse ; orchard in fair condition, but foliage already badly eaten by worms ; could not spray both sides thoroughly on account of the very high wind.

2nd application, May 16th.—Could not spray on account of rain.

3rd application, May 30th.—Fine but very windy ; bloom all fallen ; this is only the second spraying, as the trees were in full bloom when the weather cleared up after the second trip.

4th application, June 12th.—Prospect of rain to-night ; canker worm and green fruit worm at work ; sprayed trees healthy and showing well for a crop.

5th application, June 26th.—Fine. Scab appearing on Snow Apples.

6th application, July 10th.—Fine. Sprayed trees in good condition ; apples clean and large. Mr. Halliday sprayed all his orchard except checked trees.

I inspected Mr. Halliday's orchard and found the following results :—
Spy—Sprayed, 92 per cent. clean ; unsprayed, 4 per cent. clean.
Ben Davis—Sprayed, 96 per cent. clean ; unsprayed, 50 per cent. clean.
Snow—Sprayed, 92 per cent. clean ; no unsprayed Snows in this orchard, but in a neighbor's orchard along side they were almost worthless.

On November 23rd Mr. Halliday writes—

"I consider the spraying of the fruit trees in my orchard this season a great benefit. On the trees sprayed, fully 95 per cent. of the fruit was found to be clean and sound, free from worms and scabs, while on the unsprayed not more than 20 per cent. were good. The benefit was most noticeable on the Spys and Snows. The foilage on all the sprayed trees remained green and healthy to the end of the season. I would fully recommend all who wish to get good, clean, marketable fruit from their orchards, to spray the trees four or five times during the season."

Markdale, Grey Co.—Mr. Thos. Mercer's Orchard.

1st application, May 5th.—Fine after a rain ; leaves about one-half inch long ; orchard in bad condition ; infested with oyster-shell bark louse, green and woolly aphis, bud moth, tent-caterpillar, Tussock moth, etc.

2nd application, May 18th.—Could not spray on account of rain ; blossoms nearly out ; sprayed trees clean, others badly eaten. Mr. M. will apply the mixture when the weather permits.

3rd application, June 1st.—Fine. The second application was not made as arranged as the pump would not work. Persons visit this orchard nearly every day to see the results.

4th application, June 14th.—Spraying followed by heavy rain ; considerable improvement has been made in the general appearance of this orchard.

5th application, June 28th.—Could not spray on account of rain ; green fruit worm and codling moth at work. Mr. M. will spray when it clears.

6th application July 12th —Fine, apple crop light, the foliage having been destroyed by insects last year.

I inspected Mr. Mercer's orchard and found the following results :—

Snow—Sprayed, 89 per cent. clean ; unsprayed, 16 per cent clean.

St. Lawrence—Sprayed, 96 per cent. clean ; unsprayed, no clean fruit.

Russet—Sprayed, 90 per cent. clean ; no unsprayed trees.

Talman's Sweet—Sprayed, 93 per cent. clean ; unsprayed, 28 per cent. clean.

Canada Red—Sprayed, 88 per cent. clean ; unsprayed dropped its crop.

On Nov. 27th Mr. Mercer writes :—

"I consider the spraying of fruit trees a great benefit. My orchard is nearly all old trees and did not bear very well. The leaves were very small before spraying, and after they were sprayed they were of a dark green, healthy color. The last few years the fruit has been small and scabby, and this year the apples are entirely free from scab and are large and healthy looking, especially the St. Lawrence, Snow and Talman's Sweet. I would recommend anyone who has an orchard and wants to grow good fruit to spray the trees four or five times during the season. "I intend spraying next season, as I am well pleased with the results of this year's spraying."

SHELBURNE, DUFFERIN COUNTY.—MR. M. HARRISON'S ORCHARD.

1st application, May 6th.—Cloudy ; leaves well advanced some being one-half inch in diameter ; orchard in good condition, well trimmed and scraped ; found oyster-shell bark louse, aphis, bud moth and tent-caterpillar.

2nd application, May 19th.—Cold and foggy ; blossoms nearly out ; a small orchard but very well kept.

3rd application, June 2nd.—Fine ; this orchard is clean while across the road is an orchard stripped of foliage.

4th application, June 15th.—Fine.

5th application, June 29th.—Fine ; some codling moth and apple worm at work ; apples large and clean.

6th application, July 13th.—Fine ; sprayed trees are in good condition and some heavily loaded.

I inspected Mr. Harrison's orchard and found the following results :—

Talman's Sweet—Sprayed 91 per cent. clean ; unsprayed dropped its fruit.

Snow—Sprayed 96 per cent. clean ; unsprayed 24 per cent. clean.

Harvest—Sprayed 90 per cent. clean ; unsprayed 5 per cent. clean.

KEENE, PETERBOROUGH CO.—MR. JAS. ELMHIRST'S ORCHARD.

1st application, May 1st.—Showery ; had to apply the mixture while the trees were still wet ; tent-caterpillar already very bad ; oyster-shell bark louse bad ; trees need pruning and scraping.

2nd application, May 15th.—Heavy rain until 2 p. m. ; applied the mixture in a heavy gale.

3rd application, May 27th.—Could not spray on account of rain ; Mr. Elmhirst made the application on the 29th, but it was immediately followed by rain.

4th application, June 10th.—Fine ; bud moth and green fruit worm at work.

5th application, June 24th.—Fine ; fruit and foliage clean.

6th application, July 8th.—Cloudy, followed by rain at night ; a little scab showing ; codling moth doing slight damage Mr. Elmhirst sprayed the remainder of his orchard after each application given the experimental trees. The result was that the whole orchard was kept clean of caterpillars, with the exception of those trees marked not to be sprayed, some of which were badly infested. Surrounding orchards were eaten up with them. Mr. Elmhirst said his orchard was alive with them last year.

I inspected this orchard and found the following results :

Harvest—Sprayed, 90 per cent, clean ; no unsprayed fruit.

Snow—Sprayed, 92 per cent. clean ; no unsprayed Snows.

Bellefleur—Sprayed, 92 per cent. clean ; unsprayed, 60 per cent. clean.

Ben Davis—Sprayed, 96 per cent clean ; no unsprayed trees.

Haas—Sprayed, 96 per cent. clean ; unsprayed, 36 per cent. clean ; dropped most of its fruit.

There was no fruit on either the sprayed or unsprayed Colverts and Spys.

Alexander—Sprayed, 88 per cent. clean ; no unsprayed trees.

The woods and unsprayed orchards in this section were stripped of their foliage both last year and this year.

On Nov. 23rd, Mr. Elmhirst writes as follows :

"I think spraying a great benefit. The fruit was free from scab and worm. I also found a great improvement in the foliage, as well as the fruit. The foliage stayed on much longer this year than other years, and looked better. I could not expect much this year, as it rained every time we sprayed but the last twice. The trees were badly eaten by the caterpillar last year, and I think spraying a great help to destroy them as well as other insects. The results of spraying were very satisfactory, and intend spraying another year."

HAVELOCK, PETERBORO' CO—MR. ROBT. JOHNSTON'S ORCHARD.

1st application, April 29th.—Fine. Buds just bursting. Tent-caterpillar very bad here.

2nd application, May 12th, Warm, followed by heavy rain. Trees alive with tent-caterpillar ; a few bud moth at work ; used six ounces of Paris green ; Duchess and Snow could not be sprayed as they were in full bloom.

3rd application, May 26th.—Heavy rain; could not spray; Mr. Johnston did the work on the 29th. Sprayed trees are free from tent-caterpillar while unsprayed ones are alive with them.

4th application, June 9th.—Fine. Bud moth, canker worm, green fruit worm and tent-caterpillar at work.

5th application, June 23rd.—Fine. Fruit and foliage clean and healthy.

6th application, July 7th.—Fine. Scab showing a little on Snows.

7th application, July 26th—Fine. A few codling moths working. I inspected Mr. Johnston's orchard and found the following results:—

Snow.—Sprayed, 96 per cent. clean; unsprayed, 81 per cent. clean.

Talman's Sweet.—Sprayed, 92 per cent. clean; unsprayed, 50 per cent. clean.

Spy.—Sprayed, 96 per cent. clean; unsprayed, dropped their fruit.

Greening.—Sprayed, 90 per cent. clean; unsprayed, no fruit.

Demorestville, Prince Edward Co.—Mr. John Crawford's Orchard.

1st application, May 5th.—Appearance of rain. Blossoms showing color; first spraying should have been done about two weeks earlier. Bud moth and tent-caterpillar very bad: found also canker worm, green fruit worm, cigar and pistol case-bearers and aphis at work. The people were astonished when shown so many insects which they had never noticed before.

2nd application, May 18th.—Unsettled. Could not spray as trees were in full bloom.

3rd application, June 1st.—Fine. Foliage clean and healthy, but not so free from insects as it would have been had not the last spraying been omitted.

4th application, June 15th.—Fine. Could only spray thoroughly from one side on account of a high wind.

5th application, June 29th.—Fine. Foliage clean and healthy.

6th application, July 13th.—Fine. Codling moth at work.

On visiting Mr. Crawford's orchard I found the following results:—

Bellefleur.—Sprayed, 80 per cent. clean; unsprayed, 28 per cent. clean.

All the other apples in this orchard were packed when I arrived, but Mr. Crawford says they are the most perfect fruit that he ever had from his orchard. He says that the Kings and Wagners would show as good a percentage as the Bellefleurs. The foliage on the sprayed trees is still (October 16th) in first class condition.

On Nov. 24th, Mr. Crawford writes as follows:—

"Regarding the experimental spraying done in my orchard this summer, I would say it certainly was a benefit. I have always taken the best care of my orchards, but the benefit of spraying is very evident. The foliage was very abundant and well formed. The apples were a splendid sample, showing hardly any spots and very few worms in them. I was so well satisfied with the results that I bought an outfit and expect to carry on systematic spraying in all my orchards next season, anticipating the very best results."

Milford, Prince Edward Co.—Mr. Andrew Head's Orchard.

1st application, May 4th.—Fine. Orchard well cultivated and fairly well pruned; leaves about an inch long and already badly eaten by insects; tent-caterpillar and bud moth very bad; aphis plentiful; a few cigar and pistol case-bearers and canker worms. The trees seem to be alive with insects. The first spraying should have been done earlier.

2nd application, May 17th.—Cloudy, followed by rain; insects have been checked by the spraying.

3rd application, May 31st.—Shower just after the work was finished; canker worms bad on unsprayed trees.

4th application, June 14th.—Fine. Many unsprayed trees have been defoliated by canker worms.

5th application, June 28th.—Could not work as it rained all day.

6th application, July 12th.—Fine. Some codling moth at work; sprayed, foliage in good condition.

I inspected this orchard and found the following results:—

Snow.—Sprayed, 90 per cent. clean; unsprayed, showed equal bloom, 5 per cent. clean, remainder worthless.

Greening.—Sprayed, 95 per cent. clean; unsprayed, 40 per cent. clean.

Head's Favorite.—Sprayed, 90 per cent. clean; unsprayed, 40 per cent. clean.

Ben Davis.—Sprayed, 75 per cent. clean; unsprayed, 33 per cent. clean.

Russet.—Sprayed, 80 per cent. clean, heavy crop; unsprayed, light crop, no clean fruit.

Wealthy.—Sprayed, 70 per cent. clean; unsprayed, no clean fruit, dropped most of its crop.

Spy.—Sprayed, 95 per cent. clean; unsprayed, good bloom but no fruit.

Crab.—Sprayed, good crop of clean fruit; unsprayed, heavy load but no clean specimens.

Four pear trees standing side by side were taken, two were sprayed and two unsprayed; the sprayed trees were heavily loaded with good fruit while that on the unsprayed ones was worthless.

Mr. Head writes as follows concerning the spraying in his orchard:—

"With regard to the experimental spraying done in my orchard this season I think it a great benefit. The fruit was clean and free from scab, while that which was not sprayed was small inferior fruit and very much infested. The sprayed foliage was healthy and free from injury by insects, while the unsprayed ones were nearly stripped of their foliage by them. I am confident people will have to spray their fruit trees in this district or there will be little use of trying to raise fruit.

Wellington, Prince Edward County.—Mr. D. Gillander's Orchard.

1st application, May 3rd.—Fine ; strong wind. Tent-caterpillar, bud moth and aphis at work. This orchard is in the worst condition of any in this division. It has received poor cultivation and very little attention ; needs pruning and scraping, and is badly infested with oyster-shell bark louse.

2nd application, May 16th.—Rained both before and after spraying ; blossom buds just showing color.

3rd application, May 30th.—Fine. Could not spray as trees were in full bloom.

4th application, June 13th.—Fine Green fruit worm is doing some damage.

5th application, June 27th.—Fine, followed by heavy rain on 28th ; foliage in good condition.

6th application, July 11th.—Fine. Fruit and foliage clean ; very little codling moth.

In Mr. Gillander's orchard I found the following results :—

Talman's Sweet—Sprayed, 96 per cent clean ; unsprayed, 76 per cent. clean.

Spy.—Sprayed, 92 per cent. clean ; unsprayed, 15 per cent. clean.

Holland Pippin—Sprayed, 90 per cent. clean; unsprayed, 15 per cent. clean.

Baldwin—Sprayed, 100 per cent. clean ; no unsprayed trees.

The dealer who bought the orchard said that the apples were the cleanest he had found this year.

Colborne, Northumberland Co.—Mr. N. D. Snetsinger's Orchard.

1st application, May 2nd —Fine, but windy. Leaves about the size of rose leaves and already badly eaten by insects which are very numerous in this orchard. Found tent-caterpillar, cigar and pistol case-bearers, bud moth, aphis and oyster-shell bark louse.

2nd application, May 15th.—Fine, followed by rain on the 16th. Trees about ready to break into bloom; insects still at work; can already see a difference between sprayed and unsprayed trees.

3rd application, May 29th.—Cloudy, followed by a heavy rain. Trees are in full bloom ; did not spray.

4th application, June 12th.—Cloudy. In addition to insects previously mentioned, green fruit worm and canker worm are at work.

5th application, Jnne 26th.—Fine. Sprayed, trees clean.

6th application, July 10th.—Fine. Codling moth doing some damage. Case-bearers have been very bad in this orchard and have damaged both sprayed and unsprayed trees.

I examined Mr. Snetsinger's orchard and found the following results :—

Bellefleur.—Sprayed, 87 per cent. clean ; no unsprayed fruit.

Spy.—Sprayed, 80 per cent. clean; unsprayed, no fruit.

Russet.—Sprayed, 60 per cent. clean ; unsprayed, no clean fruit.

Snow.—Sprayed, 80 per cent. clean ; unsprayed, 36 per cent. clean.

Wagner.—Sprayed, 84 per cent. clean ; unsprayed, 8 per cent. clean.

Greening.—Sprayed did not bear ; unsprayed, 52 per cent. clean.

Baldwin.—Neither the sprayed nor the unsprayed trees fruited.

Mr. Snetsinger writes as follows concerning the spraying in his orchard :—

"*Re* the spraying in my orchard in 1899, would say the spraying has been a success. The trees that were sprayed had fully 75 per cent. of good fruit, and would have had more if the third application had not been missed on account of the trees being in full bloom. Of my apples last year 75 per cent. dropped off the trees after they were half grown. I thought it was on account of the dry weather, but this year was drier than last and not 10 per cent. of the apples dropped from the trees. If I had not sprayed I would not have had any apples at all, as my orchard was infested with all kinds of destructive insects. By spraying the foliage of the orchard was kept fine, and I expect to reap more benefit next year from the spraying done this year. Next spring I intend to commence spraying early, and continue until the apples are past all danger."

Markham, York Co.—Mr. A. H. Crosby's Orchard.

1st application, April 26th —Fine ; buds just bursting ; tent caterpillar at work; oyster-shell bark louse very bad, some limbs being completely covered. The trees are in sod, badly affected with apple tree canker, and need scraping and pruning badly.

2nd application, May 9th,—Fine ; bud-moth and tent-caterpillar at work. The latter are doing terrible damage in some orchards in this neighborhood.

3rd application. May 22nd Showery. Could not spray as the trees were in bloom.

4th application, June 6th —Fine. Foliage on unsprayed trees badly eaten ; sprayed trees clean. On account of high wind trees could only be sprayed from one side. Scab appearing badly on unsprayed fruit and foliage.

6th application, July 4th.—Fine. Sprayed foliage mostly clean.

7th application, July 21st.—Fine. Sprayed trees in good shape ; very little codling moth.

I inspected Mr. Crosby's orchard and found the following results :—

Spy.—Sprayed, 72 per cent. clean; unsprayed dropped fruit and foliage is in bad condition.

Harvest.—Sprayed, 95 per cent. clean ; unsprayed, no fruit.

Baldwin.—Sprayed, 88 per cent. clean ; unsprayed dropped the crop.

Snow.—Sprayed, 90 per cent. clean ; unsprayed, 30 per cent. clean, light crop.

Holland Pippin.—Sprayed, 80 per cent. clean.

Under date of Nov. 22nd, Mr. Crosby writes as follows :

"The spraying in my orchard was a success this year in regard to foliage and fruit. There-

was a marked difference in the foliage. You could easily tell the difference forty rod away on the Spy trees. The difference between sprayed and unsprayed Baldwins at the time of picking was very great. There were only a few apples left on the unsprayed trees. The Holland Pippins were entirely free from scab, the finest we have had for years. The sprayed Snows were free from scab ; of the unsprayed very few remained on the trees. The Early Harvest were really fine. It was something new for us to have Harvest apples that were fit for use. I am convinced that spraying will prevent scab and kill all tent-caterpillars. I intend to spray thoroughly next year."

BEAMSVILLE, LINCOLN CO.—MR. I. G. HOUSER'S ORCHARD.

1st application, April 25th.—Fine and warm ; buds just bursting ; oyster-shell bark louse ; apple-leaf bucculatric, and larvæ of codling moth in cocoons on this orchard ; tent-caterpillar already at work ; trees are well trimmed and scraped, but there is some apple tree canker here.

2nd application, May 8th.—Cool and cloudy ; this orchard will soon be in bloom ; tent-caterpillar and bud-moth at work.

3rd application, May 20th.—Cool and cloudy ; could not spray as trees were in bloom ; no insects working on sprayed foliage.

4th application, June 5th.—Fine and hot ; sprayed foliage clean and healthy.

5th application, June 19th.—Fine.

6th application, July 3rd.—Fine and windy ; very little codling moth yet.

7th application, July 17th.—Rain, could not spray.

I inspected Mr. Houser's orchard and found the following results :—

Spy—Sprayed, 84 per cent. clean ; unsprayed, 10 per cent. clean.

Greening—Sprayed, 60 per cent. clean ; unsprayed, 24 per cent. clean.

Fall Pippins—Sprayed, 70 per cent. clean ; unsprayed, dropped fruit.

This orchard has not done well this year. It stands in sod and bore heavily last year. This with the severe drouth of last summer probably accounts for the failure.

Mr. Houser writes as follows :—

"The apples, either sprayed or unsprayed, were of an inferior quality ; I had very few good apples, none to sell. However, I do not condemn the practice of spraying, I know it produces good effects on other fruits, and even on the apple trees sprayed by you this year there was quite a good percentage, more of apples free from worms than upon those not sprayed. I can testify, however, that spraying kills the caterpillar all right."

OMEMEE, VICTORIA CO.—MR. JOS. SANDY'S ORCHARD.

1st application, April 28th.—Fine. Buds just bursting. Tent-caterpillar at work. Orchard in sod. Trees injured by oyster-shell bark louse, apple tree canker and borers.

2nd application, May 11th.—Fine after the rain. The caterpillars are something terrible in this orchard, and are much worse on the unsprayed trees than on the sprayed. Used six ounces of paris green to the barrel.

3rd application, May 25th.—Rain after the work was completed. A few caterpillars still on the sprayed trees ; the unsprayed trees are alive with them. Baldwin, Spy, Ben Davis and Russet were not sprayed, as they were in full bloom.

4th application, June 8th.—Fine. Sprayed foliage clean and healthy ; unsprayed badly eaten by tent-caterpillar.

5th application, June 22nd.—Rained in the morning.

6th application, July 6th.—Fine. Most varieties well loaded. While many unsprayed trees were almost stripped of foliage by the tent-caterpillar, the sprayed trees have suffered no noticeable damage.

7th application, July 24th.—Fine. While all the fruit here looks clean, the sprayed fruit is especially so.

I inspected Mr. Sandy's orchard and found the following results.

Ben Davis—Sprayed, 96 per cent. clean ; unsprayed, 70 per cent. clean.

Snow—Sprayed, 90 per cent. clean ; unsprayed, no fruit.

Harvest—Sprayed, 85 per cent. clean ; unsprayed, 30 per cent. clean.

Colvert—Sprayed, 90 per cent. clean ; unsprayed, fruit dropped.

Spy—Sprayed, no fruit ; unsprayed, bore about one peck of inferior fruit. Spy trees used in experimental work unfortunately had no fruit. Mr. Sandy sprayed all the Spys except the check trees and they are well loaded with good fruit.

On Dec. 1st Mr. Sandy writes as follows :—

"It is our opinion that spraying is a great benefit to fruit growers. This year, however, we can see the contrast more in the foliage than in the fruit, as the fruit crop is small in this section, and the apple scab not very bad. However, we believe it just as reasonable to expect good results from spraying fruit trees as from Paris greening potatoes."

PRINCE ALBERT, ONTARIO CO.—MR. W. F. WEIR'S ORCHARD.

1st application, April 27th.—Fine. Buds just bursting. Osyster-shell bark louse plentiful here.

2nd application, May 10th.—Fine, followed by rain on the 11th. Bud moth and tent-caterpillar quite plentiful; also a few green fruit worms.

3rd application, May 23rd.—Fine. Could not spray as trees are in full bloom.

4th application, June 27th.—Appearance of rain. The foliage of the sprayed trees is clean; of the unsprayed much eaten.
5th application, June 21st.—Fine.
6th application, July 5th.—Fine. Sprayed fruit and foliage clean and healthy.
7th application, July 22nd.—Fine. Very little codling moth here.

Inspected Mr. Weir's orchard and found the following results.
Talman's Sweet—Sprayed, 100 per cent. clean ; unsprayed, 76 per cent. clean.
Snow—Sprayed, 90 per cent. clean ; unsprayed, 60 per cent. clean.
Unknown Variety—Sprayed, 92 per cent. clean ; unsprayed, 40 per cent. clean.
Greening—Sprayed, 95 per cent. clean ; unsprayed, no bloom.
Russet—Sprayed, 88 per cent. clean ; unsprayed, 72 per cent. clean.
Ben Davis—Sprayed, 100 per cent. clean ; unsprayed, 50 per cent. clean.
Spy—Sprayed, 92 per cent. clean ; unsprayed, no fruit.
Colvert—Sprayed, 100 per cent. clean ; unsprayed, 50 per cent. clean.

REPORT

OF THE

INSPECTOR OF FUMIGATION APPLIANCES

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REPORT OF THE INSPECTOR OF FUMIGATION APPLIANCES.

To the Hon. the Minister of Agriculture:

Sir,—I beg to submit herewith my report as Inspector of Fumigation Appliances, in the Ontario nurseries.

Visit to Maryland.

Pursuant to your instructions, I left Guelph for Maryland on Thursday afternoon, March 30th, to iuquire into the best modes of fumigation as practised in that State. Washington was reached the next afternoon (Good Friday)—too late, however, to make any inquiries that day. Next morning I called on Dr. L. O. Howard, U. S. Entomologist, and Prof. Marlatt, his first assistant, who cheerfully gave me much information regarding their work in the Division of Entomology, and elsewhere. The latter showed me the fumigation house in which he had done experimental work, and pointed out very carefully the defects as well as the merits of the house. Both of these officers concurred with the idea that I should visit Prof. W. G. Johnson at College Park, Maryland, as he had done excellent work during the last two years in combating the San Jose Scale in the nurseries of Maryland.

Accordingly a visit was made to College Park, where I spent considerable time with Prof. Johnson. He explained the construction of the various kinds of fumigation houses in use in the State, as well as the one at the College, and gave me the benefit of his two years, experience in fumigation work in large nurseries.

His methods are simple, and, therefore, all the more effective, and easily carried out by the nurserymen. Many of the complicated appliances used in the early fumigation houses have been discarded, and the best proportions of the ingredients used in the generation of the gas have been definitely settled. Photographs of the chief types of fumigation houses and tents were secured from Prof. Johnson, in order to give the Ontario nurserymen some idea of their appearance and construction.

Prof. Johnson discussed the details of the work with me at some length: the houses, boxes, and tents; the length of time to fumigate; the danger to trees and men; the chemicals, and the proper quantities of each, to be used for every 100 cubic feet of air space in the fumigation house; the best and safest way to distribute the chemicals to the nurserymen; and the methods to be employed so that every nurseryman's stock will be fumigated. Most of the suggestions made during this discussion, I attempted, on my return, to put into practical operation at the inauguration of fumigation work in the Ontario nurseries.

I reached Guelph on my return on Tuesday, April 4th, and reported orally to you in Toronto on Wednesday, when I received definite instructions to proceed with the work as rapidly as possible.

The following Regulations for the fumigation of Nursery Stock had already been sent out by the Department of Agriculture:

Regulations for the Fumigation of Nursery Stock.

The following regulations have been prescribed by Order of the Lieutenant-Governor in Council in accordance with the provisions of the *San Jose Scale Amendment Act*, passed April 1st, 1899:

1. Fumigation must be carried on in a box, room, compartment, or house suitable for the purpose, which must be air-tight and capable of rapid ventilation. The owner or proprietor will notify the Minister as soon as preparation for fumigation is complete. The Minister will thereupon order an inspection of the fumigating appliances. No fumi-

gation under the Act is to be carried on until such inspection has been made and a satisfactory report sent to the Minister.

2. The Inspector, after examining and measuring the box or house, or other compartment in which fumigation is to be carried on, will prescribe the amounts of material to be used for every fumigation, and the instructions as to the same must be carefully followed out. The Inspector may, if thought advisable, supply the material for each fumigation in weighed packages.

3. The fumigation house (which shall include all apparatus or appliances used in the fumigation, such as generators, etc.) is to be subject to the orders of the Minister on the recommendation of the Inspector. Subject to the approval of the Inspector, the fumigation house may be on other lots than those on which the nursery stock is growing.

4. The fumigation is to be by hydrocyanic acid gas produced according to the instructions of the Inspector and from such formulas as he prescribes for the purpose.

5. The fumigation is to be continued for a period of not less than forty-five minutes. After the expiration of this time or longer, and when fumigation is complete, the house is to be thoroughly ventilated for fifteen minutes at least.

6. No person is to be allowed to enter the fumigating house until after the ventilation period has expired. Entering before may prove injurious, if not fatal, as the gas is a deadly poison.

7. The fumigation of buds and scions may be done in fumigation boxes of not less than thirty cubic feet capacity, the same to be subject to inspection and approval.

8. Immediately after inspection of the fumigation house, the Inspector will report to the Minister, and the Minister or the Inspector will thereupon give permission in writing for the owner or proprietor to begin fumigation.

9. The owner or proprietor of every nursery will attach to every box and to every package of nursery stock a certificate as follows, and he will furnish every purchaser who so desires with a copy of the same.

CERTIFICATE OF FUMIGATION

This is to certify that this package of nursery stock, consisting of..

....

....

was properly fumigated on the..............day of..............................., 1899, in accordance with the regulations prescribed by Order of the Lieutenant-Governor-in-Council, in accordance with 62nd Victoria, chapter 35.

....

....

The following are the sections of the *San Jose Scale Act* dealing with the fumigation of Nursery stock, 62nd Victoria, chapter 35:

3. The owner or proprietor of any nursery shall not send out or permit any plant to be removed from his nursery without the same being first fumigated by hydrocyanic acid gas in accordance with regulations prescribed by order of the Lieutenant-Governor.

4. No person shall sell or dispose of or offer for sale any plant obtained, taken or sent out from a nursery unless the said plant has previously been fumigated in accordance with these regulations.

5. In case the Inspector finds scale in any nursery and so reports to the Minister, the Minister may thereupon inform by writing, the owner, or proprietor, or manager of said nursery of the existence of scale in his nursery, and the owner, or proprietor, or manager of said nursery shall not thereafter permit any plant or plants to be removed from the said nursery until the Inspector reports to the Minister that it is safe in the public interest to permit the said nursery stock to be removed after fumigation.

INSPECTION.

On account of the lateness of the season, and the great amount of work to be done in a few weeks, in the matter of construction of suitable houses, your Inspector con-

sidered it advisable, with your consent, to alter the plan of inspection to a slight extent. The nurserymen were asking for advice as to the construction of fumigation houses, and it became necessary to visit the nurserymen for the purpose of instructing them in this matter. At the same time the following circular of specific instructions was sent out so that building operations could be commenced as soon as possible :

SUGGESTIONS REGARDING FUMIGATION HOUSES, GENERATORS, VENTILATION, ETC.

1. What is wanted is some air-tight place, either a separate house or a portion of some other building, easy of access, substantially constructed, and arranged so as to afford speedy ventilation after each fumigation.

DIMENSIONS.—The dimensions of the house or room will depend on the size of the stock to be fumigated and the quantity of stock, remembering that each fumigation takes 45 minutes A common size is 8 x 10 and 7 feet high, with shanty roof. If stock is set on end, houses will have to be higher. Where shade trees are handled, a greater length may be necessary.

2. Do not make too large a house, for all unoccupied space adds to the expense of fumigation, involving an increased supply of cyanide and acid.

The stock is put in for fumigation by standing on end, tops up ; or by laying on side, tops all one way and as near the generator as may be convenient. When laid on side, if short, two piles or more may be put in, tops to tops and roots towards wall.

3. CONSTRUCTION.—Studs 2 x 4 will do for the frame work. On the outside of the studs it is usual to put a covering of tongued and grooved sheeting, well nailed ; on that a coating of tar-paper, carefully and sufficiently lapped at edges ; and then a covering of boards, up and down. Some put tongued sheeting on the inside and two thicknesses of rough boards, with tar paper between, on the outside. Others put tongued sheeting, tar-paper, and a covering of rough boards inside, and rough boards outside.

The paper used, whether tarred or building paper, should be of good quality, thick and of close texture, to prevent gas from getting through.

The roof must also be air-tight. It is usually made by putting tongued sheeting on the rafters ; then a covering of paper, the same as on the sides of the house ; and over that, either shingles or pitch and gravel.

4. FLOOR.—There is no need of a floor. The earth will do, if the foundation is properly banked up outside.

5. Ventilation.—This is by two doors, a door and a window, or a door and a roof ventilator,—generally one of the two former. Two doors are convenient for taking the stock out after fumigation. When two doors, or a door and a window, are used, they should be opposite each other, or as nearly so as possible, to facilitate the ventilation. The doors should be double thickness, of refrigerating pattern, with felting along the edges of the casement. The window sash should also be made of refrigerating pattern, with felting alongside the edges of the frames. Both doors and windows should be hinged to open out.

When doors are closed they should be bolted near top and bottom to keep them in place, and locked to prevent opening by any one but the person in charge of the work.

6. GENERATOR.—A good, glazed earthenware crock, of one or two gallons capacity, will serve as a generator.

When everything is ready, the crock should be set inside of the door ; the water, acid, and cyanide put into it, according to instructions on tin ; and the door immediately shut, bolted, and locked.

7. CAUTIONS.—

(1) Open house (doors and windows) in 45 minutes ; and do not enter or allow any one to enter for at least 15 minutes afterwards, as the gas is very poisonous.

(2) Remember that the invisible vapor arising from cyanide in a room or elsewhere is very poisonous and should not be inhaled.

(3) Do not fumigate stock when it is wet.

A bill of supplies, etc., at cost price will be sent at a later date.

WM. LOCHHEAD,
Agricultural College, Guelph.

It will be observed that much latitude as to the size and shape of the fumigation house was allowed. Many nurserymen dealing chiefly in small fruits preferred a box. In some cases a nursery packing-box was made into a fumigation box by adding another thickness of boards, with tar-paper between. Such a box is easily and cheaply operated. It is filled with the shrubs or young trees, which are kept in place by two slats ; then it is inverted, bottom upwards, on a level piece of ground in which is sunk the crock for holding the chemicals. As soon as the cyanide is added the loose earth is tramped about the edges of the box, so that no gas can escape. This mode of treatment is recommended to nurserymen who do not handle much stock, and do only a local trade.

Most of the nurserymen, however, made substantially constructed houses according to the suggestions outlined in the circular, but as many of the houses have no solid foundation, and are simply built on the ground, there is a liability to warping of the framework during the winter and spring, which will cause the doors to misfit their casements. This matter should be looked into very carefully before the fumigation season begins, for I have found by experience that doors must fit their padded casements exactly, else there will be a considerable leakage of gas at the time of fumigation, which will tell very decidedly against the operation as a thorough method of killing any San Jose Scale that may be present.

Mode of Fumigation.

The formula which Prof. Johnson, of Maryland, found most effective, was adopted in Ontario, The proportions of the chemicals used were :—

$\frac{25}{28}$ ounce of potassium cyanide,
$1\frac{1}{4}$ fluid ounces of sulphuric acid, and
$1\frac{7}{8}$ fluid ounces of water,

for every 100 cubic feet of air space in the box or building, At the time of the visit of the Inspector the cubic capacity of the box or building was computed, and the number of times the nurseryman purposed fumigating, was ascertained. These data were sent to the College at Guelph, where the cyanide was carefully weighed out in doses suitable for each fumigation, and placed in tins ; and the sulphuric acid was measured out and put into bottles. On each tin was pasted a label stating the capacity of the building to be fumigated, the amount of cyanide in the tin, and specific instructions for using the chemicals in the fumigation. To each nurseryman was also sent a graduated glass vessel for measuring out the acid. The following is a copy of the label put on the tins :

POISON.

Cyanide of Potassium for One Fumigation, size of House being ...... cubic feet.

Put into generating crock ...... ounces of water, as measured in glass beaker.

Then pour slowly into same crock ...... ounces of acid as measured in same beaker.

While pouring the acid into tho water, stir the water with a piece of clean hardwood stick, 2 or 3 feet long, to prevent accident from spurting.

When everything is ready pour the cyanide from this tin into the same crock, shut the door of the house immediately, and leave for 45 minutes. Then ventilate for at least 15 minutes before anyone enters the fumigating house.

Your Inspector was assisted by the following persons : Prof. F. C. Harrison, who visited the Winona, Grimsby, St. Catharines, and Niagara nurseries ; Prof. J. B. Reynolds, who visited the Mitchell, Blyth, Goderich, and Owen Sound nurseries ; Mr. G. E. Fisher, who visited the nurseries in the south-western part of the Province ; Prof. Shuttleworth, who gave much assistance in the distribution of the chemicals from the Ontario Agricultural College.

Injury to Stock.

In several instances we received letters informing us of the death of nursery stock by the fumigation process. As the formula used in Ontario was exactly the same as that used in Maryland and other States, and had been found very reliable after some years' experience with all kinds of nursery stock, the results appeared unaccountable. I wrote immediately to prominent fumigators in the United States asking for their experience

during the past year with hydrocyanic acid gas. Prof. Johnson, of Maryland, wrote as follows:

"I do not understand why your nurserymen should kill any tree by fumigation. Can it be possible that they fumigated trees after the buds commenced to swell and open? If such is true they would injure the buds, especially peach and plum. We have no trouble in this State, and we have this past fall and spring fumigated over five million trees. We have even fumigated with stronger doses than you used, and have made trial tests of fumigating the same trees over several times, with no bad results so far as the trees are concerned. I think the trouble has likely been that the trees were too far advanced. Did not the winter kill or injure much stock (as it did in the United States), which is now being laid to fumigation? Some of our nurseries in the North and West lost nearly everything (and do not fumigate)." Other experienced persons replied in a similar strain.

In order to get at the actual facts I sent out a card of inquiry to all the nurserymen. The card contained two questions:

1. Were any of your trees injured or killed by fumigation? If so, how many?
2. Did you follow carefully the directions for fumigation?

Remarks.

Replies were received from a large majority of the nurserymen, and a large percentage of them reported favorably. I take the liberty of making public some of the replies:

"I was alarmed last spring, and thought that some of the stock was damaged by fumigation, especially peaches, as they were so long in starting buds. I had several complaints of the same nature, which I never had before. But now I have come to the conclusion that they were damaged by the severe winter and not by fumigation."

B. W. Secord, Fonthill.

"Yes. Did not count, would say about 50 killed. The trees killed were out in leaf. The process seemingly checks growth." A. G. Hull & Son, St. Catharines.

"So far a larger percentage than in former years have been reported as being dead, but I cannot tell whether this is to be attributed to the very severe winter, the prolonged drought, or to the fumigation." H. L. Janzen, Berlin.

"Owing to damage by frost it is almost impossible to say whether any additional damage was done by fumigation. I have not noticed any damage to trees that had sound roots, but think perhaps it has damaged still further roots injured by frost."

E. D. Smith, Winona.

"My customers report some trees dying, but don't know whether fumigation is the cause. Very wet weather at first, then very dry, may be the cause."

R. J. Mackie, Oshawa.

"A good many trees went back this year, but I attribute it to the extreme winter and not to fumigation." W. A. Holton, Hamilton.

"Soon after fumigation the trees looked bad. It seemed to cause the trees to be much slower to bud out, so many thought they were dead." F. W. Wilson, Chatham.

"Some plum stock were injured and some killed. Must be done before buds start. The trouble is when we are forced to dig for late orders." M. W. Robinson, Kettleby.

"No. I planted 150 trees myself, that were fumigated, and every one is doing well."

J. J. Collins, St. Catharines.

"No. We fumigated large quantities and had considerable stock left over after treatment, which we transplanted very successfully."

Brown Bros. Co., Brown's Nurseries.

"Some that were advanced, not very many. There were so many trees injured by the winter, that it is hard to say whether many were hurt by fumigation, but we don't think there were." Smith & Reed, St. Catharines.

"In cases where the buds were beginning to burst the stock was injured."

D. Dempsey, Stratford.

"Yes. Possibly one-half or more." E. M. SMITH, St. Catharines.

"Yes. 1,000 to 2,000 were injured or killed." L. K. SHOURDS, Wellington.

"A few slightly injured. The injured ones were partly in leaf when fumigated, but leafed out again when planted." W. McK. ROSS SONS, Chatham.

"Cannot definitely state, but feel assured that one-half was injured." C. P. CARPENTER & SONS, Winona.

"Some of the roses and plums did not seem to do well after. Could not say what was the cause, as I never had them act that way before." E. HERSEE, Woodstock.

"Cannot say, but do not think so. We noticed the small fibrous roots near the body of the tree turned brown a little." MORRIS, STONE & WELLINGTON, Fonthill.

"Yes. Over 90 per cent. I will quit growing trees if we have to fumigate them, as the trees will not stand it in this climate. I have handled trees over thirty years, and never saw a tree injured with the San Jose Scale yet." G. B. WILSON, Virgil.

It will be seen from the foregoing replies that the majority of the nurserymen are of the opinion that the injuries were due to one or more of the three causes: (1.) The very severe winter of 1898-9, which destroyed very many young trees in all sections of the country; (2.) The prolonged drought, which was preceded by a long spell of wet weather; and (3.) the advanced condition of the buds at the time of fumigation. As every nurseryman is in a position to fumigate without any delay this coming season, I am fully convinced that no complaints in this matter will be forthcoming. Many of the smaller nurseries complain of vexatious delays involved in fumigation. With the adoption of the *box* for shrubs and small orders the inconvenience is reduced to a minimum, and no nurseryman need object to the operation. It is, moreover, a mistake to blame the process for all the deaths to trees. Some nurserymen have taken advantage of the process to shield themselves from the great losses of the last season by laying all the blame on the method of treatment; and in some sections I find the orchardmen quite averse to buying fumigated nursery stock. They maintain, very unjustly, that the nursery trees died from the effects of the fumigation treatment.

One entensive grower of nursery stock candidly wrote me as follows: "Replying to your favor of the 21st inst., would say that last winter was the most severe winter on nursery stock we have ever experienced, and many trees, while not dead, yet perhaps were hurt more or less by the winter, and it is impossible to know this. No doubt this accounts in a measure for the failure of some stock. Besides, we have very little rain during the spring and summer months, and in view of these facts, it is no wonder that more stock was lost this season than usual. And, while some nurserymen may attribute the loss of stock to fumigation, yet we doubt it very much. We think the peculiar conditions of the weather had more to do with it than anything else."

PHOTOGRAPHS OF SOME FUMIGATION HOUSES.

I take the liberty of inserting three illustrations of fumigation houses. Fig. 1 shows the fumigation house at the Agricultural College, Guelph. It is substantially built, dressed lumber being used in its construction. Its size is 10 feet long, 8 feet broad, and 7½ feet high on the average. It contains 600 cubic feet. The frame of 2 by 4-inch scantling has two thicknesses of lumber, both matched, tongue-and-grooved, and firmly nailed on the outside, with a thickness of tarred paper between. Besides, the seams on the outside are covered with strips. The doors are of the refrigerator style, and the casements are padded with soft felting. Large wooden buttons are placed on the outside, around the edge of the door to force it closely into the padded casement. The roof has a thickness of matched boards, then a thickness of tarred paper, then shingles. The cost of the complete building was a trifle over $20.

Figure 2 is a view of the fumigation house of Mr. E. D. Smith, of Winona. This house is a double one, and has two separate compartments, so that while a load of stock is being fumigated in one compartment ventilation is taking place in the other. It has two thicknesses of lumber, one matched, tongue-and-grooved, the other either the same or cover-siding well-matched, and two thicknesses of paper between. The doors are the same and padded all around.

Fig. 3 shows the three buildings on the packing grounds of the Brown Brothers Co., at Brown's Nurseries. The large double fumigating house occupies the middle portion of building (3). It is 16 feet wide and 32 feet long, with a division in the centre, and doors on both sides, opposite each other. Two smaller fumigating houses are in building (1). These are small houses about 8 feet square, and used exclusively for small stock. These connect with the frost-proof cellar (2), where all small stock orders are filled after having passed through the fumigating houses.

Morris, Stone & Wellington, of the Fonthill Nurseries, have two fumigating houses,—one, a double building, 15 by 18 by 11 feet, the other, a single building, 6 by 18 by 11 feet,—both substantially constructed.

J. H. Wismer of Port Elgin, John Conn of Kemptville, Thos. Dangerfield of Kemptville, N. T. Selby, of Newcastle, and others, have good buildings, but I was unable to secure photographs for publication.

General Recommendations.

With a year's experience in conducting Fumigation Work in the nurseries of Ontario, I beg to make the following suggestions and recommendations with regard to future operations with Hydrocyanic Acid Gas for the fumigation of nursery stock:

(1.)—Every fumigation house should be carefully inspected before the opening of the season for the distribution of nursery stock. I am perfectly convinced that many of the houses require overhauling. For example, doors will not fit their casements tightly; leakages will occur about the roof; and foundations will not be banked up properly with earth. I believe that very few buildings will be found air-tight, if I may draw conclusions from tests made with the fumigation house at the College. This house was very carefully constructed,—more carefully than the majority of the houses at the nurseries,—yet I had great difficulty in getting an air-tight building. Hydrocyanic Acid Gas is very penetrating, and no carelessly constructed building ought to be allowed.

(2)—Fumigators should be appointed to superintend the fumigation at every nursery. The regulations could then be carried out in every respect, and the public could rely with greater confidence on the thoroughness of the work.

I know of one or two nurserymen who are of the belief that fumigation is unnecessary, is of no avail against the scale, and is positively dangerous to the stock. Such persons believe that there is nothing wrong in violating the law in this case.

Especially should the nurseries in the San Jose Scale infected areas be carefully watched, and all stock leaving these be carefully fumigated. It is decidedly of advantage to the nurseryman to have his stock properly fumigated, so that there would be no posibility of scale being distributed through the Province by means of nursery stock. One nurseryman writes me as follows: "We are very anxious to see the provisions of the Act carried out as we believe it is not only an advantage for the suppression of the Scale (should there be any), but also for all other insect pests that bother nursery stock." Another writes as follows: "I quite agree with the Minister of Agriculture about insisting on the proper performance of fumigation, as I believe it is beneficial not only to the country at large, but to the nurserymen themselves."

(3.)—The chemicals, viz., potassium cyanide and sulphuric acid, should be as pure as possible. The cyanide should be 98% pure, and the acid have a specific gravity of 1.84. Probably the best method of distributing the chemicals is for the Government to buy the materials at the best wholesale rates, and have the College send them out in measured quantities to the nurserymen. In Maryland, I was informed, the nurserymen were only allowed to secure the chemicals from the Inspector of fumigation.

In view of the fact that considerable difficulty was experienced in the collection of he cost of the materials which were sent out from the college last spring, I would beg to uggest that in future the chemicals be sent C. O. D.

(4)—During the year 1899 experiments were carried on at several stations with the object of determining the least amount of cyanide which will kill the scale on different shrubs and trees, yet without injury to the plants. The results show that smaller amounts than those used by our nurserymen are not reliable, and scales may escape death,—in the case of ordinary nursery stock; but with more tender forms, such as buds and very small peach trees (from 2 to 3 feet high), it would be safer to use a two thirds strength of cyanide and acid, *i. e.*, $\frac{2}{3}$ ounce of potassium cyanide, 1 fluid ounce of sulphuric acid, and $1\frac{1}{2}$ fluid ounces of water, for every 100 cubic feet capacity of the fumigating house.

All of which is very respectfully submitted,

W. LOCHHEAD,
Inspector of Fumigation.

ONTARIO AGRICULTURAL COLLEGE,
Guelph, Ont.

A LIST OF THE NURSERIES OF ONTARIO, 1899.

Morris, Stone & Wellington, Fonthill	Fumigation house on premises, 2,800 cubic feet.
Stone & Wellington, Toronto	Fumigated at M. S. and W's.
A. L. Root, Fonthill	do do
Pelham Nursery Co., Fonthill	do do
B. W. Secord, Fonthill	Fumigation house.
J. E. Crow, Ridgeville	do
H. A. McCoomb, Ridgeville	Fumigated in M. S. and W's.
John Kerr, Queenston	No fumigation, trees too young.
Wm. Armstrong, Queenston	do do
Jas. Sheppard & Son, Queenston	No fumigation.
Lowry & Stuart, St. David's	Fumigation house, 640 c. ft.
Chas. Lowry, do	do
F. Walker, Virgil	Fumigated in G. B. Wilson's.
G. B. Wilson, Virgil	Fumigation house, 4,680 c. ft.
Esau Hube, St. David's	
W. H. Lee & Son, Virgil	Fumigated in G. B. Wilson's.
S. Lobb, Virgil	do do
F. L. Hancock, Stamford	
Thos. Berriman, do	do do 389.
E. Morden, Niagara Falls South	Fumigation house, 280.
Alex. Muir, Niagara	do 324.
W. B. McFarland, Niagara-on-the-Lake	do 141.
A. M. Smith, St. Catharines	do
Smith & Reed, do	do 1,550 cubic feet.
A. G. Hull & Son, do	do 960.
Alex. Glass, do	do 240.
R. Buchanan, do	No stock ; fumigate next year.
J. J. Collins, do	Fumigation house, 460.
Brown Bros. Co., Brown's Nurseries	do 2,816.
Chase Bros. Co., Colborne	Fumigated by Brown Bros.
F. W. Bowman & Son Co., Toronto	do do
E. D. Smith, Winona	Fumigation house, 2,300.
E. M. Smith, do	do 384.
Wm. Smith, do	No trees.
R. R. Smith, do	Using G. Chambers' house.
Geo. Chambers, do	Fumigation house, 1,056.
C. P. Carpenter & Son, Winona	do 1,536.
J. J. Dean, Winona	Fumigated by E. D. Smith.
W. C. Dawes, do	No trees.
W. F. Geddes, do	Fumigation house, 441.
T. B. Henry, do	Using G. Chambers' house.
I. E. Henry, do	Using I. Van Duser's house.
Ira Irving, do	No trees.
Keep Bros., do	do
J. S. Cockburn, do	Fumigated by Winona Nursery Co.
I. E. Vanduzer, do	Fumigation house, 360.
Winona Nursery Co , Winona	Fumigated in E. D. Smith's.
Brown Bros., Winona	
Jonathan King, do	
Thos. Rolph, do	
T. H. P. Carpenter, Winona	
A. B. Foran, Winona	
B. Muir, do	
J. Milburn, do	
C. J. Carpenter, do	
Grimsby Nursery Co., Grimsby	Fumigation house, 1,280.
Norman Nelles, Grimsby	Used Van Duser's.
Geo. Smith, do	No trees.
Boyes Nelles, do	Fumigated by Winona Nurseries.
Jonathan Book, do	Fumigation house.
W. A. Holton, Hamilton	do 640.
Webster Bros., do	do 240.
J. Gallagher, do	Evergreens.
Haskins Wine Co., do	Fumigation house, 642.
A. Haskin, do	Evergreens.
Ward Bros., Bartonville	
J. W. Burns, Stoney Creek	No trees.

NOTE.—The figures in every case are the cubic feet capacity of the fumigation house.

LIST OF NURSERIES.—*Concluded.*

Brock Galbraith, Stoney Creek	Fumigation house, 105 cubic feet.	
G. W. Hill, Fruitland		
Fruitland Nursery Co., Fruitland	do	1,620.
John Munroe, Southend		
Wm. Ellis, St. David's	No trees.	
H. S. Hurd, Burlington	Fumigation house, 1,700.	
C. H. Davidson, do	Fumigated by Hurd and E. D. S.	
S. T. Anderson, Waterdown	No trees.	
Cavers Co., Galt	Fumigated by Caldwell & Co.	
Caldwell & Co., Galt	Fumigation house.	
H. L. Janzen, Berlin	Fumigation box, 90.	
M. Milgau, Bright	Fumigation house, 1,377.	
E. Hersee, Woodstock	do	630.
A. M. Graham, St. Thomas	do	160.
Pierson Bros., do		
H. L. McConnell, Grovesend	do	160.
C. A. Baker, London	do	510.
J. Gammage & Sons, London		
D. Dempsey, Stratford	Fumigation house, 100.	
J. McAinsh, Wellburn	do	145.
Strathroy Nursery Co., Strathroy	do	1,075.
J. Stuart & Son, Goderich	do	300.
J. W. Skinner, Mitchell		
A. H. Jacobs, Blyth	do	250.
B. Gott, Arkona	Fumigation box, 140.	
Chas. Ellis, Meaford	Fumigation house, 475.	
J. H. Wismer, Port Elgin	do	904.
W. Fleming, Owen Sound	do	500.
S. H. Newman, do	do	250.
H. Pike, do		
R. J. Doyle, do		
M. W. Robinson, Kettleby	do	300.
Leslie Nurseries, Toronto	do	1,760.
John Barnes, Leamington		
W. L. Clarke, do		
Thos. Rowley, Winona Nurseries, Leamington	do	588.
Geo. D. Ellis, Leamington	No trees.	
Dennis Smith, do		
E. E. Adams, do	Fumigated at Winona Nurseries.	
A. Fox & Son, do	Fumigated at Winona Nurseries.	
J. Mitchell, do	do	do
J. M. Fields, do	Fumigation house, 123.	
McKenzie Ross & Sons, Chatham	do	75.
F. W. Wilson, Chatham	do	1,325.
C. B. Palmer, Kingsville		
Geo. E. Jones, do	No trees.	
B. Jasperson, do	Fumigation house, 480.	
Geo. Cady, Ruthven	No trees.	
N. T. Selby, Newcastle	Fumigation house, 300.	
R. J. Mackie, Oshawa	do	385.
L. K. Shourds, Wellington	do	1,000.
Wallace Woodrow, Picton	do	
W. C. Reid, Belleville	do	190.
J. W. Johnston, Campbellford	do	160.
H. A. McIntosh, Dundela	do	190.
Thos. Dangerfield, Kemptville	do	640.
John Conn, do	do	640.
W. J. Kerr, Renfrew	do	36.
Chas. Kellert, Port Perry	No trees.	
John McIlroy, Canton	do	
R. Breckon, Toronto		
Colin McDonald, Toronto		
David Tait, Iron Bridge, Algoma	Fumigation house.	

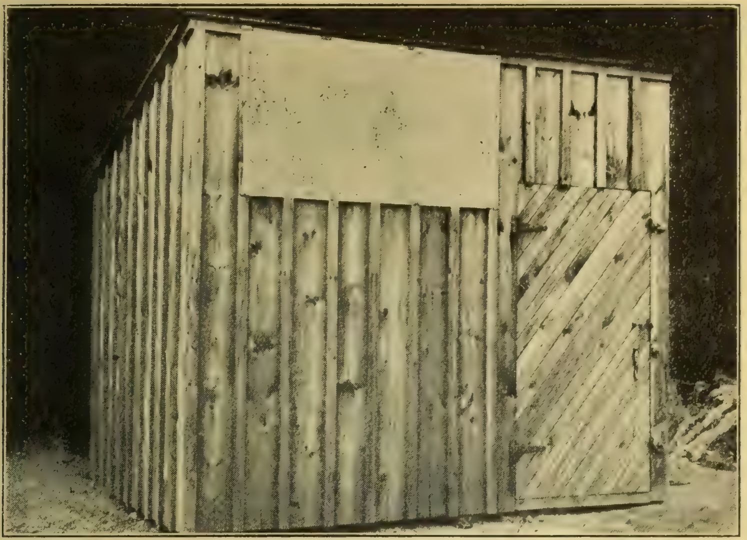

Fig. 1. Fumigation house at the Agricultural College, Guelph, size, 8 x 10 x 7½; two doors, front and back; wooden buttons on door. The earth was banked well around the outside. Cost: dressed lumber, $16.00; hardware, $2.55; labor, $5.00; total, $23.55. By using undressed lumber the cost would be $1.00 less (The photo was taken before the earth was banked up.)

Fig. 2. Fumigation house of Mr. E. D. Smith, Winona. This is a double house of two large compartments The stock is fumigated on the wagon. Such a house is suitable for large nurseries only.

Fig. 3. Three buildings on packing grounds of Brown Bros. Co., Brown's Nurseries.
(1) Two small fumigating houses at far end of this building, connecting with
(2) Frost-proof cellar, 100 feet long by 40 feet wide.
(3) The large double fumigating house with doors open ; an office at left hand, and a tool house and label room at right end.

ANNUAL REPORT

OF THE

BEE-KEEPERS' ASSOCIATION

OF THE

PROVINCE OF ONTARIO

1899.

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1900.

ANNUAL REPORT

OF THE

ONTARIO BEE-KEEPERS' ASSOCIATION

1899.

To the Honorable the Minister of Agriculture

Dear Sir,—I have the honor to submit herewith the twentieth Annual Report of the Ontario Bee-Keepers' Association, in which will be found the papers read at the Annual Meeting held in the City of Toronto, on the 5th, 6th and 7th of December, 1899, and a full report of the discussions thereon. The report of the Inspector of Apiaries and also the audited statement of the finances of the Association are also submitted.

I am

Yours truly,

W. COUSE,

Secretary.

OFFICERS FOR 1900.

President,	C. W. Post, Trenton.
1st Vice-President,	John Newton, Thamesford.
2nd Vice-President,	J. D. Evans, Islington.
Secretary,	Wm. Couse, Streetsville.
Treasurer.	Martin Emigh, Holbrook.

Directors:

District No. 1	W. J. Brown, Chard.
District No. 2	J. K. Darling, Almonte.
District No. 3	M. B. Holmes, Athens.
District No. 4	C. W. Post, Trenton.
District No. 5	J. W. Sparling, Bowmanville.
District No. 6	J. D. Evans, Islington.
District No. 7	A. Pickett, Nassagaweya.
District No. 8	James Armstrong, Cheapside.
District No. 9	John Newton, Thamesford.
District No. 10	F. A. Gemmell, Stratford.
District No. 11	W. A. Chrysler, Chatham.
District No. 12	Samuel Wood, Nottawa.
Ontario Agricultural College	Dr. James Mills, Guelph.

Auditors,	Will J. Craig, Brantford. Edw. E. Dickinson, North Glanford.
Inspector of Apiaries,	Wm. McEvoy, Woodburn.
Assistant Inspector of Apiaries,	F. A. Gemmell, Stratford.
Representative to Industrial Exhibition, Toronto,	A. Pickett, Nassagaweya.
Representative to Western Fair, London,	John Newton, Thamesford.
Representative to Canada Central Exhibition, Ottawa,	J. K. Darling, Almonte.

Next place of meeting, Niagara Falls.

LIST OF MEMBERS FOR 1900.

Name.	Address.
Armstrong, James	Cheapside.
Armstrong, John	Streetsville.
Brown, W. J	Chard.
Brenton, F	Corbyville.
Boomer, A.	Linwood.
Bailow, Joel	Delta.
Byer, J. L.	Markham.
Beaupree, M. C.	Simcoe.
Bailey, John.	Bracebridge, Box 41.
Blais, Adolphus	Glensandfield.
Couse, William	Streetsville.
Chrysler, W. A.	Chatham.
Comire, A. O., M.D.	St. Francois du Lac, Yamaska Co., Que.
Cummer, D. W	Florence.
Craig, Will J	Brantford.
Cox, William	Hamilton, 12 Bruce street.
Colson, I. T	Purbrook.
Darling, S. F	Perth Road.
Dickson, Alex	Lancaster.
Darling, J. K	Almonte.
Davidson, B	Uxbridge.
Davidson, C. W	Mount Albert.
Dickinson, Edw. E.	North Glanford.
Davison, John F.	Unionville.
Emigh, Martin	Holbrook.
Evans, J. D	Islington.
Farmer, Thos. W.	Ancaster.
French, Augustine	North Glanford.
Farran, C. C.	Farran's Point.
Gemmell. F. A	Stratford.
Gale, H. E.	Ormstown, Que.
Goodfellow, Alex	Macville.
Gemmell, John	Lanark.
Gray, A. W	Burridge.
Hand, E. G	Fenelon Falls.
Holmes, M. B	Athens.
Hall, J. B	Woodstock.
Heise, D. W.	Bethesda.
Jeater, W. H	Kincardine.
Johnston, Geo. E.	Bracebridge.
Kennedy, J. A.	Glenroy.
Kendrick, J	New Dublin.
Munro, J. A.	Munro Mills.
Munro, J. G.	Clenroy.
McEvoy, Wm	Woodburn.
McEwen, Robert	Renfrew, Box 69.
Miller, F. J	London, 223 Dundas St.
McLaughlin, D. H.	Vankleek Hill.
McKnight, R	Owen Sound.
McLaughlin, Alex	Cumberland.
Madden, Michael	Sarsfield.
Nolan, Dennis	Newton Robinson.
Newton, John	Thamesford.
Pickett, A.	Nassagaweya.
Pierie, John	Drumquinn.
Post, C. W.	Trenton.
Potter, D. M.	Elora.
Ross, D. D.	Martinton.
Reaman, Josiah	Carville.
Robinson, Geo. E.	Hatchley Station.
Sloan, W. H.	Milford.
Smith, R. H	St. Thomas.
Sparling, J. W.	Bowmanville.
Smith, H. C	Athens.
Sibbald, H. G	Cooksville.
Saunders, Geo. E.	Hornby.
Smart, N.	Collingwood.
Shaver, J. H.	Cainsville.
Stewart, Alex	Canfield.
Switzer, J. F.	Streetsville.
Schilz, Mathias	Renton.
Shantz, Aaron	Haysville.
Shultz, H. G	Clontarf.
Sarrizine, Maxime	Rockland.
Sherrif, G. G.	Clarence.
Taylor, Alex.	Paris.
Thomas, Joshua	Deacon.
Wisner, Isaac G	South Cayuga.
Wood, Samuel	Nottawa.
Wood, George	Erasmus.
Walton, W. S	Ballantrae.

FINANCIAL STATEMENT

Of the Ontario Bee-keepers' Association made to the Department of Agriculture for the Province of Ontario for the year ending Dec. 5th, 1899 :

RECEIPTS.		EXPENDITURE.	
Cash on hand from last year	$ 46 60	Grants to other societies, fairs, etc.	$205 00
Members' fees	114 00	Expenses of meetings	3 00
Legislative grant	500 00	Officers' salaries	75 00
Affiliated societies' fees	40 00	Directors' fees and expenses	139 08
For copy of stenographic report	15 00	Postage and stationery	25 89
		Printing and advertising	9 79
		Periodicals for members	74 10
		Cost of reporting	30 00
		Executive, *re* Paris exhibition	32 90
		Auditors' fees	4 00
			$598 76
		Balance on hand	116 84
Total	$715 60	Total	$715 60

W. J. BROWN, President.

MARTIN EMIGH, Treasurer.

Examined and found correct this 5th day of December, 1899.

H. G. SIBBALD, } Auditors.
G. E. SAUNDERS, }

ONTARIO BEE-KEEPERS' ASSOCIATION.

ANNUAL MEETING.

The twentieth annual meeting of the Ontario Bee-keepers' Association was held in the Albion Hotel, Toronto, on Tuesday, Wednesday and Thursday, December 5th, 6th and 7th, 1899. The President, W. J. Brown, of Chard, occupied the chair.

The minutes of the last annual meeting were read by the Secretary, Mr. William Couse, and, on motion of Mr. W. A. Chrysler, seconded by Mr. J. H. Shaver, they were confirmed.

THE PRESIDENT'S ADDRESS,

By Mr. J. W. Brown, Chard.

It was with some misgivings that I assumed the honored position of presiding over your deliberations, but, when called upon to do so, I took up the task with a determination to do my duty without fear or favor from any source, and never to relinquish the one object I ought to have in view, namely, your interests at every turn. My success is largely due to the two worthy gentlemen whom you elected to co-operate with me. Those two gentlemen have done all in their power to assist me to carry out the work for the past year. Each Director responded at every call, and, with very few exceptions, every man in the ranks fell into line and offered every assistance in his power. And, knowing this, it is with perfect confidence I stand before you to-day, believing that you will again assist to make this annual meeting one of the most pleasant and profitable in the history of the Association. Let our watchword be, "Peace and harmony in our ranks," for a house divided against itself will surely fall.

The past season has been a very unfavorable one in nearly all portions of the Province; scores of bee-keepers have been compelled to feed their bees in order that they might have sufficient stores to winter on.

There are many questions which will be laid before you for your consideration. Among others, I might mention the question of the Association purchasing from the Goold, Shapley & Muir Co., of Brantford, the *Canadian Bee Journal*, and assuming the management of that journal. With this question I am not prepared to deal at any great length. However, I would like to hear your opinion as to the probable cost of such a purchase, the probable cost of running the *Journal*, and as to whether we could have all this done for less money than it costs us at present, or would we be in any better position by purchasing the *Journal* than we are now in?

Another matter is the Paris Exposition in 1900. It will be remembered that at our last annual meeting a motion was passed to the effect that if the Executive Committee deemed it advisable to make an exhibit at Paris, that the matter be arranged. It was deemed advisable by your Executive Committee to make an exhibit at Paris, but not at Earlscourt; therefore, your Committee spared no pains to arrange with the Canadian Commissioners of the Paris Exhibition to have a creditable exhibit of honey at Paris next year, the cost of said exhibit to be borne by the Department of Agriculture at Ottawa. This question may require some further explanation, which I have no doubt will be given by the Commissioner himself in the course of his address before you. There are many features in connection with this matter which are of much interest to you: the fact of this year's crop not being in all cases of an A 1 quality; there is the question of your being permitted to send over a supply of next year's honey to replace what will be sent of this year's crop; as well as the question of your being allowed to recommend the person to whom the care and setting up of the exhibit will be assigned. I would not recommend the sending of an exhibit to a foreign country that would not do justice to our industry and our country, and unaccompanied by a fit and proper person to look after it.

So far as I can learn, our Inspector of Apiaries has been overcoming foul brood wherever he met that pest in a bee-yard. His report will be laid before you in due time, as will also all other official reports.

In compliance with another motion passed at our last annual meeting your committee saw fit to recommend the names of Messrs. J. K. Darling, M. B. Holmes, J. E. Frith and Fred. Gemmell as fit and proper persons to lecture at Farmers' Institute meetings, and forwarded the names to the superintendent of Farmers' Institutes.

Before closing I take this opportunity of thanking you all for your able and generous assistance to me in carrying out the work of the Association during the past year, and hope that during this meeting every officer and member will continue to assist me to preserve the best of order, and not allow anything to mar the harmony now existing among us all. (Applause).

Mr. Darling: In discussing the President's address I do not know that I will say very much about it. With regard to the taking over of the *Canadian Bee Journal*, I do not know whether now would be the proper time to air my opinion on that or not, but I might say that I do not know that it would be just wise, and perhaps it would be as well to give a reason: a great many of us have been dissatisfied in the past with what we received for our money, and also in the way we were treated at times, but I am convinced by what I have seen during the last two or three months that there is a very great prospect of a change for the better, and if we can be as well served, as there is a possibility of being served, and at the same time refrain from taking up something we do not know very much about, I think we would be wise to let people who understand such things run that part of the business and pay them a fair remuneration for what we receive. With reference to the crops of the season I am sorry there has been a good deal of truth in what Mr. Brown has said. Some odd individuals have secured what some of us would call in any season a large crop—perhaps they would not call it a large crop this year owing to the locality in which they live being better than the general run, but take it all over the country, the crop has been from small down to nothing; and we are not alone. This may tend to the raising of prices. In fact the price of honey has been on the downward tendency for a good many years past. What is in the future for bee keepers is more than I can tell, but I do not think it is altogether an unmixed evil.

Mr. Gemmell: With regard to taking over the *Journal*, I remember some five or six years ago there was quite a talk of doing the same thing, and there was a good deal of opposition to it. It was thought by some that it would be better if the *Journal* was managed independently, while other thought if the Association took the matter up our interests would be better served. I do not know what the opinion of the Association is now; but as far as I am concerned I am quite willing to help in any way that may be decided upon by this meeting, whether it be taken over or left as it is. There are a number of things to be considered which would take quite a little time to state now.

Mr. McKnight: I had not thought of the subject at all, but I see by the *Journal* it has been canvassed, and a variety of opinions expressed upon it. As Mr. Gemmell says, this is not the first time in the history of the Association when a movement of this kind has been on foot. When it was about to pass from the hands of The D. A. Jones Company into that of the present proprietors, there was a pretty strong movement made in the same direction, and there were a number of the members of the Association strongly in favor of taking over the *Journal*, and in fact, I think two or three special committee meetings were held in connection with the matter. Some of the members thought it would not be a wise course. I was among the number, and I am of that opinion still. I do not entertain that opinion because of any fear I have of lack of sufficient material to conduct the *Journal* properly; the difficulty I see in the way is a very important one, and that is, available funds. You cannot conduct the paper for nothing, and I do not think this Association is sufficiently large to warrant us in undertaking the conducting of a special journal in connection with its own proceedings.

Mr. W. J. Craig, Editor: While I am not officially appointed to say anything in this connection, you have been made aware through the *Journal* that our company would willingly hand over the management of that publication to the Association if so desired, and it is for this purpose, to find out the minds of the members of the Association, that our President has brought it up. At the same time we want, perhaps, more than anything else, your co-operation in connection with the management of the *Journal*. We cannot get along without that, and I thank the members of the Association who have extended to me their sympathy and,—indeed more than their sympathy—their help in

this connection. There may have been things that we have not liked, and there are some things that our firm of publishers did not like. However, these things all belong to the past, and we would like the hatchet to be buried at this time, and all to pull together once for all.

Mr. Brown: With regard to what Mr. Craig has just said; the proprietors are not over-anxious to dispose of the *Journal*, but would dispose of it at a fair remuneration. On the other hand, with the active co-operation of the Association, we will have a better journal than we have had in the past, and I think that under the present management it will be all right in the future. Of course, there were things which appeared in it which were not very pleasant for some of the members; and I question if the Association was the owner of the *Journal* to-day, whether there might not appear things in it that would not be very pleasant to some of the members. It is impossible to please everyone.

Mr. Craig: When I took the position I occupy with the *Journal*, it was on the distinct understanding that they would not interfere with the reading matter of the *Journal*.

Mr. Heise: While I think it would perhaps be in the interest of the Association to conduct a journal, my opinion would be identical with that of Mr. McKnight. Under the present circumstances I do not see how it could possibly be done with the funds available.

The President asked Mr. Couse to express an opinion upon the matter of taking over the *Journal*:

Mr. Couse: I suppose the first matter we would need to consider would be the financial matter. I feel that we cannot afford to take it over; I feel, though, that we can afford, each of us, to do a little better than we have done before, which will result in the *Journal* being more useful to us all, and in that way we can, perhaps, assist Mr. Craig. That is about as brief as I can put the matter.

Mr. Pickett: Those who look after the business of the Association know that our means are limited, and we should not go into anything that has even the appearance of extravagance. I am not sure but that the success we have met with on other occasions, would warrant us asking for that amount under existing circumstances. I think the Government would require to know that we really need this, and that it would be a vast improvement upon what we have had, and also that it was the wish of the Province at large that such a *Journal* be maintained. In approaching the Minister of Agriculture for an increase some years ago I found, as perhaps many another has done, that the Government are very careful, and, while our demands were not extreme, we did not succeed in getting all we asked for. At the present we are not suffering with any very great amount of indebtedness, and if we incur the liability that a journal would necessitate, I fear they would think we were asking rather much at their hands, and I see no hope of any other source of gaining that point; and while I need not lay any claim to supporting the present *Journal*, I am in hearty sympathy with those who are willing to try. I think the only method open at present is to leave it in the hands of the present owners.

IN MEMORIAM.

Moved by M. B. Holmes, seconded by F. A. Gemmell, "That whereas the Ontario Bee-keepers' Association has, since its last annual meeting, lost an honored and respected officer by the sad death of Herbert N. Hughes, of Barrie, and whereas during the years he had served as a Director in the Board of Management of this Association, he had, by the deep interest ever manifested in matters pertaining to our industry, shown that the interests of bee-keepers were being well studied and advanced at every opportunity, while at the same time his straightforward and gentlemanly bearing, coupled with his genial and friendly manner, won for him a very warm place in the hearts and affections of all who knew him; be it therefore resolved that we, the Ontario Bee-keepers' Association, take this, our first opportunity, of giving a united expression of the grief that possesses us in the separation from our friend and co-worker, and that we extend to the family of our late colleague our heart-felt sympathy and condolence in their great grief, and we trust that the shadow and gloom pervading the home in consequence of this bereavement

may be dispelled by the presence of the Great Comfortor, the Wonderful Counsellor, who brings consolation, comfort and cheer even in the darkest hour to all who commit their ways unto Him. And be it further resolved that this resolution be recorded in the minutes and an engrossed copy, signed by the President and Secretary, be sent to the family of the late Herbert N. Hughes." Carried.

SPRING MANAGEMENT IN THE APIARY.

By D. W. Heise, Bethesda.

On receiving notice from our worthy President some time ago that the Executive Committee had seen fit to place my name on the program for a paper on spring management, with the request that I at once endorse the action of the said committee. I replied saying, that while I thought very little of the subject assigned me, yet I would endeavor to have something to say upon it at this convention. My reason for saying that I thought very little of the subject was not because I considered it one of slight importance, but from the fact that it has within the last few years received considerable attention at conventions and through the different journals, and more particularly from the fact that the subject was so ably and thoroughly handled only a year ago at the city of Guelph by our esteemed friend, Mr. Sibbald. So while it would seem to be pretty well exhausted, yet perhaps after all there are always those in our ranks who could largely improve on their spring management, and with the thought before me that "keeping everlastingly at anything will eventually bring success," I take encouragement, and will endeavor to briefly outline what I would consider "ideal" spring management in my locality when bees are wintered on the summer stands.

The first step towards proper and successful spring management should be taken not later than the fifteenth of September of the fall previous, (that is when there is no fall flow,) by contracting the brood chamber with a division board to a size accommodating the strength of the colony, which may be from four to seven combs. The remaining combs in the space so contracted, whatever the number may be, should contain not alone what we might consider was sufficient stores, but a supply that we are absolutely certain will be an abundance to carry the colony safely, not only through the winter but right up to the time of fruit bloom. By preparing the stocks in this way the bee-keeper will have no occasion to open up the hives for an examination until the weather is sufficiently warm that all danger of chilling the brood or breaking the cluster will be reduced to a minimum. The first examination of bees in the spring should not be made until some calm day when the thermometer will register seventy degrees or more in the shade, and after the bees have been permitted for some days to gather both water and natural pollen. When the above conditions are present the hives should be opened, and the strength and condition of the colony ascertained. All hives should now be contracted to a capacity best suited to the size of the cluster, that is, in case such had not been attended to the fall previous. As the colonies of average strength will be found at this date, with from two to four frames of brood in different stages of development, these frames should be raised up sufficiently high so the honey along the top bars and in the corners can be uncapped. This will cause the bees to move it, and they will certainly store it in the cells that surround the brood, where it will be of most advantage. In the case of no honey being along the top bars of the frames which contain the brood, frames of honey (first having been uncapped) should be placed one on each outside of the brood next proper. Uncapping in this way serves a twofold purpose: first, by providing the liquid honey for larvæ food, and of easy access; and, secondly, by clearing the coast for the queen to widen out her circle. All garbage and dead bees should be removed from the hive floors at this time—a very simple matter indeed if the bee-keeper has been so wise as to use only loose floors; unfortunately some of us are still hampered with permanent floors. All the foregoing having been attended to, the operation will be completed by replacing the clean quilt (if such is used) with a gum cloth, putting on top of this three or more thickness of paper, return the top packing, contract the entrance, and close the hive. While it takes some little time to outline the above manipulation, yet in actual practise

only a very few minutes are required for the whole operation. Any queenless colonies that are found at this time should be forced on not more than three frames, and united at the very first favorable opportunity and given a queen. In eight or ten days, if the weather be propitious, and the bees have been able to gather from the fields moderately, more uncapping should be done, the brood chamber enlarged, if found necessary; frames containing honey should be placed outside of the division board "a la Sibbald," which is a positive preventive of starvation, and an excellent stimulant for the extension of the brood nest. Do anything and everything that will not disorganize or endanger the colony, but that which will compel them to convert honey into brood; because it is bees we must get at this time, if we expect to have our supers rapidly filled when the main harvest arrives. From this time up to fruit bloom, frames should be added to the brood chamber, and frames of honey inserted, as often as the condition of the colony and the amount gathered from outside may demand, always selecting a fit and proper day for the operation. At the opening of fruit bloom is the time when all full winged queens should be clipped. Having recently noticed considerable discussion in the bee journals regarding this operation, I am persuaded to mention the method I practice, and for which I am indebted to Mr. McEvoy: As the queen is heading for the top bar when the frame is held on an angle, I catch her by the wings with the finger and thumb of the right hand, and then pass her over to the finger and thumb of the left hand, securing her by the two legs on her left side. When held in this position she cannot squirm, and the operator's right hand is at liberty to remove (with a pair of scissors) any portion of the wings desired. When completed, simply hold her close to the comb, relax the pressure suddenly, and she is at liberty without her body ever having been touched.

Now, to come back to the time of fruit bloom: all strong colonies, and those of average strength, will be in a condition to have their full quota of brood frames returned to the brood chamber. Any colonies that are above the average strength and appear crowded, should be provided with supers filled (or partly so) with brood frames, allowing the queen to occupy them if she chooses to do so. By this method we get the dark fruit bloom and dandelion honey swapped off for bees, which at the opening of the white flow should be given to the weak colonies, a certain number of which, I think, most bee-keepers have on their hands at this season. Another very important detail requiring attention at this time is scraping all propolis from the frames and out of the rabbets, also removing brace and bur combs. Making everything clean and smooth at this time greatly facilitates the manipulation of frames in the busy season. Neither should we forget that the less propolis we leave in the brood-chamber the less we are likely to have in the supers. Having the colonies up to our ideal of strength when fruit bloom is past, our every concern should be to guard against famine striking the bees during the gap between fruit bloom and clover. This tided over, spring management ceases and summer management commences, and I will let the other fellow tell about it. I have said nothing about supplying the bees with water, neither have I said anything about having everything in readiness for the season's work. As the journals are keeping these matters vividly before bee-keepers' eyes, I conclude that a word to the wise is sufficient. Now, I do not wish to be understood that I practise in detail what I have been preaching; neither do I wish to be understood that the above is the sole and only system of spring management that can possibly lead up to success; but it is what I would practise were I not sometimes prevented from doing so through pressure from other business duties.

Mr. F. Gemmell: Mr. Heise has done the thing so well that I do not know that I shall hammer him. In regard to weak colonies, I do not care to bother with them when they are very weak; I would sooner have the colonies as nearly as possible the one strength. If I have three or four colonies that are not very strong, I would prefer doubling them up and giving them all about the same amount of combs. As far as queenless bees are concerned, I have found that, as a rule, they do not pay for the bother with them. As to uncapping the honey, I think what Mr. Heise has suggested is all right.

Mr. McEvoy: I have followed that plan off and on for seventeen or eighteen years, and I have made it pay after I got right into it and understood pretty near how to do it; but I have had it go the other way at times. I have always made it pay between fruit bloom and clover. There is a gap in most localities, and it pays to uncap some. I have

uncapped sometimes too much, and have made a mistake; but it is well to uncap two or three in an evening in the bare time, in order to supply them with unsealed stores and to feed the larvæ. I get the honey used up rapidly, and I increase in bees. A little later on I uncap more. Some bees will not uncap the old sealed honey fast enough, when they are caught suddenly, to keep pace with the amount of larvæ on hand; then it pays to look after uncapping or bruising. This year I went through the colonies three times between fruit bloom and clover, and with 95 colonies I had it so arranged that almost every frame was filled with brood clear up to the top bars and from end to end to the outside wall. Did it pay? Yes; I never did anything in my life that paid so well. I would not advise every one to do it; some might go on a morning of a spring day when there was not much to get and uncap too much. You must use judgment.

Mr. J. B. Hall: Mr. Heise's paper is excellent; the only part I object to seriously is that which says he does not practise it himself. I differ with him a little in the crowding of the bees in the fall. Bees are like communities: sometimes in the community there are no deaths, and other times deaths are large. If you contract them in the fall, they still want contracting in the spring. My practice with bees several miles from home is to leave them just as they are in the fall, and give them sufficient to last until fruit bloom. Do not unpack your hives; don't clean them out; they will clean themselves out. The contraction, if any, should be done in the spring and not in the fall. I think Mr. McEvoy will differ from me.

Mr. McEvoy: Certainly, on that point.

Mr. Hall: My experience is this: the weak colonies winter better than the very strong colonies. The middle colonies are the ones that winter best; the very strong colony is dead, generally speaking, in the spring, or very weak, and that is the time they want contracting; so do your contracting in the spring instead of the fall. The bees will contract themselves and get into a small compass. We never clip our queens like Mr. Heise said. We clip our queens, of course; we cannot run after swarms. We hunt our queen and, after finding her, we simply set her outside at the hive, and we get down on one knee at the business with a very sharp knife (shows), and we simply get the queen by the wings and use the knife, and take away the part we lay hold of.

Mr. Heise: Mr. Hall says a colony of bees will contract themselves in the fall. We know that: why then not contract the space to accommodate the size of the cluster?

Mr. Hall: In the spring, when you open up the hive at the time of fruit blossom, you will have eight cards of brood, with perhaps four or five pounds of honey in them. Then, as far as taking weak bees and uniting them with others, you are wasting your time. If they cannot pull through themselves you are better without them.

Mr. Heise: I would not attempt to equalize the bees by taking from the strong to build up the weak. But would it not be better to take the weak ones and put them together?

Mr. Hall: My experience of over twenty years is that if you take nine weak colonies and put them into three, you will have three weak colonies; if you shut them down and do not meddle with them at all, there will be sure to be some of those that will come up and be good colonies, and the others that are no good will die out; and if you put them together one of the poorest queens might be the one saved.

Mr. Heise: I did not advocate uniting weak colonies in my paper; I advocated, where there were queenless colonies, to unite them.

Mr. Hall: That is worse still; these queenless bees were born the fall before.

Mr. Heise: Mr. Hall, referring to about 10th to 20th April, how many young bees would you find hatched in that hive?

Mr. Hall: If it is a good stock of bees there will be more bees than we put in in the fall.

Mr. Heise: Your colony differs from mine.

Mr. Hall: We do not open them except they are hungry. We do not open a stock of bees in our yards until the fruit blossoms. We let weak ones die if they choose.

Mr. Dickson: Between apple blossoms and clover is a blank; sometimes the is a week and sometimes possibly a week and a half—I am down in the extrem

east end of Ontario. My practice is not to sell the buckwheat, and we save this buckwheat to feed the larvæ; and when these bees arrive you will have workers, and you will have a strong swarm which will work—and the honey will come, too.

Mr. McEvoy: I wonder how many here would be able to catch the queen by the wing like Mr. Hall does. I think we would be likely to cut a little bit more than the wing.

Mr. Hall: Not with a knife.

Mr. McEvoy: Take an ordinary farmer, and I think he would take half the bee. I admit that Mr. Hall's remark is true, speaking generally, that medium bees winter best, the weak ones fizzle out and the strong ones will go to pieces, that is, without contracting in the fall of the year; but take good strong stocks and go back to the crowding system in the fall of the year, and put them on combs solid sealed and they won't go to pieces, because I have stopped the queen from breeding.

Mr. Hall: This is outside business.

Mr. McEvoy: In or out the strong ones go to pieces, and I am going to fix it so that I can stop that. Coming to the weak colony, I will agree with you in the spring of the year. I will put two or three of them together in the fall of the year, and I will bring out a colony in the spring on the crowding system and not keep them spread or give them the whole comb or too much territory. During ten days in February in last winter we here in Ontario had a sort of Klondike weather. If the bees are spread out the steam condenses in all the combs outside the cluster and some bees starve to death, with honey in the outside, and if they had been crowded in the centre, when they wanted honey all they had to do was to lean forward. It is a sure system, and it is better than Mr. Hall's.

Mr. F. Gemmell: Mr. McEvoy is all right; he crowds them on to four or five combs, and there is no place for the queen to lay until they have wintered, and then they commence to boom right along.

Mr. Walton: Why do strong colonies succumb?

Mr. McEvoy: You can break up almost any colony. Take good strong colonies, spread out when going into wintering outdoors and empty, and there is all the chance in the world to lay in the centre, and the bees have to care for the young. The bees become restless and are worn out to no purpose, and you have spring dwindling and fizzling out. You can check that; just give them the sealed combs, and rest your queen.

Mr Walton: When do they commence to breed in the other case?

Mr. McEvoy: Later on; as they consume a little more and more they are getting further out to the spring, and you can get more fly-days; you have rested your bees and you have saved them. I am speaking from practice.

Mr. McKnight: Does not your system prevent bees from clustering?

Mr. McEvoy: No.

Mr. McKnight: I understood you to say that all the bees had to do was to lean forward.

Mr. Gemmell: They are clustered on the honey.

Mr. McKnight: They are practically spread over the comb.

Mr. McEvoy: They are crowded up solid, and some of them are behind the division board. Speaking of the division board, I would like to improve on the division board. I like to have a bee space at the ends and bottom, and if I do happen to crowd a few outside they will get in there. I do not want division boards to fit so close that I have to rip them up.

Mr. Gemmell: I have contracted in the fall and they wintered first rate, because there was no space for the queen, and in the spring they boomed right along.

Mr. Darling: Reference has been made to the strong colonies breeding early. I know what some of my experience has been. The seasons vary greatly in the eastern part of Ontario. I have seen me put out good strong colonies in the latter part of April or first of May with scarcely any bees in the hives; I have seen me put out strong colonies in the last week of March and first of April with young bees crawling all over the combs. I found the young bees crawling over the combs by the 10th April.

Mr. Hall: Mr. Heise's paper spoke of wintering them outside, and with a very arge population there will be more deaths than with a small population; for instance,

the city of Toronto has more deaths than the locality where Mr. Darling lives, simply because there are more to die; the dead bees clog the entrance and smother the balance. I might relate that one year we got no honey six or seven miles from home, and the lady of the house had a baby and the eldest girl was down with typhoid fever, and they did not want a stranger to feed the bees; and I had to go out and feed them in the latter part of October or first of November. We had thirteen nuclei. I fed my bees first, and after I got through I had some syrup left. I did not want it to be kept over to the spring, and I went to these nuclei and made two colonies of them. Allow me to tell you, contrary to my expectation, those were the two best colonies in the apiary of about eighty colonies. I would not advise anyone to do this, but sometimes things turn out different from what our expectations or calculations are. I would not run the risk of buying sugar for them, but I had it made.

Mr. DARLING: I am firmly of opinion that our bees sometimes breed in the winter and we sometimes do not know. I had one colony in particular that had a spot of brood as large as my hand on one comb and I think there were three combs altogether, and I expected that colony would be no good. It was the best colony I had when I put it out next spring. I do not think it is the breeding altogether; I think there is something else which we have not got at the bottom of.

Mr. MCEVOY: For twenty years or more I have had more or less that was not crowded on five combs, sometimes ten and fifteen. I guess this year I have about ten crowded on five combs, but I noticed in the spring of the year ten or fifteen that were not crowded, and, although they had the weight and were heavy with honey, they would not average up with the crowded ones.

Mr. DICKSON: Some would advise doubling up and trying to keep your colonies, but I say it is all very well for an amateur to try that, but since we have carried on the business exclusively we have found it does not pay to double up, neither does it pay to doctor a poor colony in the spring; let them go.

Mr. HOLMES: My experience in the matter of the small colonies tallies exactly with what Mr. Hall told us. On more than one occasion it has happened to me that the small colonies have come up and done excellent work, as good as those of a great deal more pretentious dimensions.

Mr. ARMSTRONG: My experience has been about the same as Mr. Hall's with his nuclei. When I put two or three colonies together and put them into proper shape, as a general thing they were my best colonies in the spring; that is, if they did not start breeding before the spring. I have had them to come out and cluster outside in February. I was sure that colony would go up and be no good next spring, but if they were closed up tight with full sheets of sealed honey, no room for the queen to do anything until they got some consumed, those colonies came out all right.

Mr. HALL: I have great faith in Mr. McEvoy, and I think it is four or five years ago since we hived our bees on contracted hives of five combs instead of eight. I fed them up as much as they would take, and therefore, I presume, it was solid combs they had, and in the spring they were in a nice condition. But allow me to tell you that I had to go into them and give them room for breeding purposes, and I did not get so much honey from them as in other cases. It may be my location or stupidity.

Mr. ARMSTRONG: Do you not think the reason you did not get good returns from the strong colonies was that there was a time before the main flow came that they would run down in stores?

Mr. HALL: I will tell you decidedly on that. They had too much stores. They could not consume it to raise brood, and as I was lazy I did not take out this division board until fruit bloom. But they wintered well.

Mr. GEMMELL: If you have weak colonies in the fall and double them up they will come out all right, but give them room afterwards.

Mr. HALL: But suppose they are weak in the spring?

Mr. MCEVOY: You are going on the idea that there are going to be a lot of them weak.

Mr. HALL: Do you not have weak colonies in the spring?

Mr. MCEVOY: Certainly, some.

Mr. HALL: You lose all of your nice queens. Let them be, and those that are

worth anything will come up and give some honey, and those that are worth nothing will die.

Mr. HEISE : Would you leave them on as many as 8, 10 or 12 frames ?

Mr. HALL : Whatever it is I do not meddle with them. I look under the bottom to see it they are strong. I do not touch the top at all.

Mr. WALTON : If the weak ones winter that way without being contracted, why do not the strong ones do so ?

Mr. HALL : I give you the reason : With a small entrance and large population there would be more dead, and they would drop on the bottom board, and they would suffocate.

Mr. WALTON : It is a somewhat interesting question to this convention. This spring management of bees has drawn out quite a discussion. With all the experienced bee-keepers here, I may be away behind the times, but I tell you my bees are not. I contract neither spring nor fall.

Mr. HALL : Neither do I.

Mr. WALTON : We ought to get to some settled point on this question. With reference to the weak colonies in the fall with Mr. Hall I would allow them to stay so. If they have stores enough do not meddle with them. I practice out-door wintering, but last year I wintered 25 in the cellar—they were queens I had not sold. They were rather weak, but they surpassed all the ideas and opinions of the writers in the journals. I could give the temperature and a good many things along that line, but I do not think it is necessary. I would leave the weak ones quietly alone if they were any ways protected for the winter. Also as to clipping queens, I am not in favor of clipping with scissors. I am afraid there is a liability to clip the queen in two.

Mr. DARLING : I lay my finger right on the back of the thorax and the wings come up that way, and I clip what I catch, one, two or three, and let her go.

Mr. MCEVOY : Mr. Walton, how much do you take off ?

Mr. WALTON : I take off both wings, one on each side. I think I like to have the queen evenly balanced.

Mr. GEMMELL : It is astonishing how easily they will fly if they have wings the same on both sides.

Mr. WALTON : I do not get down on one knee ; when the queen is coming right down some comb I catch her thus with the two wings. (Shows). We are always in haste in doing this thing, and I think it is the nicest way to clip wings. I suppose I learned it from Mr. Doolittle. I think Mr. Heise's paper is very good.

Mr. NEWTON : I am sure this paper has been pretty well discussed, and a good paper it has been. I think any paper that will bring out the discussion that this has led to this afternoon, is worthy of the thanks of this Association. There are some things I agree with, but most of you know I am of Mr. Hall's school, and of course, I fall in with a great many of his ways. With reference to the clipping of the queen, Mr. Heise's plan seems to me to be a very awkward one. I think if I were to try Mr. Heise's plan I would be very apt to kill the queen the first go off. In working with my hive, I sit down on the hive top ; I place my comb between my knees, and catch her as she runs up the comb, and in somewhat the same way as friend Hall does, I strike a knife across the finger, and I take about one-eighth or a quarter of an inch off one wing, which is sufficient to prevent her flying away, and this does not disfigure the queen. I do not believe in contracting in the fall. I give them a good letting alone in the spring until we have time to work with them in fruit bloom, and sometimes, if it is an extra good spring and they have been shut up, I have in mind two cases where there have been four or five cards of new combs built in. I generally find that medium stocks winter best.

Mr. WALTON : Do those who change from one hand to the other ever break the legs ?

Mr. GEMMELL : Never.

Mr. MCEVOY : Never ; if you get the two legs it is all right.

Mr. NEWTON : But we touch only the part we take away.

Mr. PICKETT : The matter which I have risen to speak of is this uniting of weak colonies in the spring. I think one of the first things we require to take into considera-

tion is the temperature at which our hives should be when breeding; and another is, how are we to get that temperature at the earliest possible moment so as to secure the required amount of bees to bring in the honey at a proper season? I presume these are two, at least, of the many things that are required. The more bees there are together and the more closely they are confined the sooner will that temperature be arrived at; the more room you give them the longer it is going to be, and the later in the season before they are going to start to breed, and the sooner they commence the sooner you may have something to replenish those old bees that have been laying back; because if they were light colonies in the fall, the chances are that there are a great many more, and therefore, even if they are left to themselves I do not wonder if you have a number of them that are no use in the spring and die, because it is so long before they can replenish their number that they outlive themselves. My impression is that if you unite them in the fall, and they are still light in the spring, which sometimes they are, I would say unite them then; you had better have one good one than half a dozen otherwise.

Mr. Hall: But you are not making them good by so doing.

Mr. Pickett: The method we take to get them good is by increasing the number of bees at the earliest possible moment, and, if they have not got the heat, you know as well as I do all the honey you could pile into your bee-hive would not amount to much. You cannot get the bees if they have not sufficient heat.

Mr. McEvoy: What do you do in the last of May with weak colonies?

Mr. Hall: The last of May with weak colonies, if we have any—sometimes we have and sometimes we have not: last year I think we had five—but, whether we have few or many, we simply go to a hive that will hold the brood, and we pick out what we think is the best queen, we take all the brooding bees away from the others and place into the hive with the best queen. Then we have a hive full of brood just fit for coming out, and just in right condition to commence on the clover bloom, and will give you lots of honey. We have a slate on every hive, and we mark what we have done, and we do not give that queen credit for anything that is good. We start with A, and we go down and go up. If you come into my yard and see the mark A 1, XX, you will know that the queen is worth her weight in gold.

Mr. Walton: Before the end of May our weak colonies are nearly all dead. Then, it looks to me, when we have our colonies contracted to four or five or six combs of sealed honey, we do not give them an opportunity to breed until late in the season, and then we have to manipulate them. If the bees breed earlier in the season, and are left to themselves and have plenty of stores, I believe we are not troubled much with spring dwindling.

Mr. Sibbald: There is another point in favor of contraction that has not been spoken of yet, and that is, getting the brood filled into the combs right up to the top bar. One reason why I favor contraction is because in the spring when we have only four or five they commence, and being good and strong they fill it right up to the very corner, and when we slide that back and put in two or three more they are ready to fill them up to the corners, and when we fill our hive we have it properly filled. It is hard to get them to fill like that, unless we practise contraction.

Mr. Hall · Mr. Sibbald does not keep a record on his hives. There are more than half the queens if left to themselves will fill those combs full from corner to corner. You saw the comb I had in Hamilton. That came out of the middle of a stock of bees.

Mr. Sibbald: How many more had you like that?

Mr. Hall: I will take you to one half of my hives and have them like that. If you had a record slate on your hives you would raise your stock from that sort of queens. If you keep your record on your hives, and just save those queens, you will see they fill up from end to end, from top to bottom, and you will find they are all like that, unless you live near a neighbor who raises drones.

Mr. Armstrong: Do I understand Mr. Sibbald opened the brood nest and put two or three combs into the centre?

Mr. Sibbald: I did not say that. We slide back the division board, and, if the first comb has honey and no brood in it at all, it will go back with the division board, and then the added combs we put in next to the brood, and if there is brood on the outside combs we would leave them in too.

SPRAYING OF FRUIT.

The PRESIDENT called upon Mr. JOHN NEWTON, of Thamesford, to open a discussion upon the "Spraying of Fruit," who said: I think this is one of the most important matters we could have before us, because we have this law and it is neglected right in our midst from spring to spring, and bee-keepers are losing bees by the thousands every spring. I feel we ought to have some more force with what we have in order that we may put a stop to it more easily than we do. Last spring I happened to be going through our village and saw a man spraying some trees, and naturally I went over to see what he was doing. He was spraying trees with Paris green. I said, "You should not do that." "Yes, I should; the spraying company men told us to do it." I said, "We have a law which says you must not do it." He said, "I do not know of any such law, and until I am informed of such a law I will keep on spraying." I said, "I will give you the law to-morrow morning, and in the meantime you do not want to do any more of it or there will be a way to stop it" I felt, to my own interest, I ought to be independent and try to stop it. I think there are bee-keepers in all localities who are affected just the same. There are men who go around with these spray pumps who do not seem to care for anybody except themselves, and the little money they get out of them in selling the spray pumps. I think we should have the law put up in places where it can be seen. I sent down to Mr. Hall, at Woodstock, and got three or four copies of the law, and sent one down to the house, and his wife looked at it, and she said, "I know he won't do it any more." I know he took warning from the slip I sent. I think if we would do this there would be thousands of bees saved.

Mr. PICKETT: I have not had any experience in the last five years in this matter. Before that I had some neighbors that indulged in spraying their plum trees, and for some considerable time I could not understand what it meant. Our bees appeared as if someone had given them liquor, and they wandered about in a listless way, eventually dying. After a time we learned it was caused from trying to gather from these sprayed trees. As the law is very explicit, I presume there is no better way under present circumstances than the way suggested by Mr. Newton, that is, letting people know what is and what is not.

Mr. WALTON: I believe there is not a bee-keeper present but is very much interested in this subject of spraying, and who has not been materially injured through it. I am glad this has been brought up. We have a law against it, but there is very little done towards educating the people to spray their trees at a certain time. Even the agents selling the spray pumps will tell you that the proper time is to spray just when the bloom is coming on, and they will argue black and white that that is the proper time.

I think it would be a good thing if the editor of the *Canadian Bee Journal* would publish this law of spraying in the spring number of the journal. Could not, too, this Association by some means have pamphlets distributed to scientific bee-keepers, who should have them distributed in their neighborhoods? It is a serious thing to have our bees die off at that time of the year; and sprayers through different parts of the country are very careless. They think they have a right to spray, and they do not know anything about the law, and therefore, they spray at any time which suits them.

MR. DICKSON: In my section, especially around my neighborhood, I make it a point every spring to get hold of these pamphlets, and I put them up in the post office. In regard to publishing the law in the *Journal* I hardly think it will do much good, because it will come pretty much only to bee-keepers and members of our Association. We could do nothing better than to distribute these notices.

Mr. SHAVER: Just a few years ago our Government sprayers went right across the road from a bee farm, and the farmer said that every morning he could find fifty to sixty bees lying around the hive.

Mr. MCEVOY: I think our friend Shaver is not quite correct in his statement. He says the "Government sprayers." Mr. Orr is the Government sprayer, and there is no man who has gone farther out of his way to warn people against wrong spraying. Mr. Orr got an immense quantity of pamphlets printed, and on the back of these is a warning not to spray while trees are in bloom, and gives instructions when to spray, and how to spray. These will be given free, and if you get a lot of these and distribute them to all the fruit growers in the locality they would see the proper time to spray.

Mr. CRAIG : It is only a couple of weeks ago that I got a copy of the Act referred to, and I have it reserved for publication in the spring *Journal.* Would it not be well to have a notice of the Act put up in local post offices, or in such places where the public would have an opportunity of seeing it and knowing what the law is in regard to this matter.

The PRESIDENT : A great many of those who spray in fruit bloom do so through ignorance, and an endeavor should be made to inform them of the law. I think sometimes pamphlets are distributed in the wrong way, and when the people get them they throw them to one side and never read them. When a man consciously breaks the law the bee-keepers are wrong in letting him slip through their fingers. It was through the voice of the bee-keepers that this law was established, and such persons who willingly and knowingly break the law should be punished.

Mr. NEWTON : I think it is a good idea to post the pamphlets in the post offices through the country. I remember the case of an old lady in our village two years ago, who sprayed while the trees were in bloom. I spoke to her about it, and she said she did not care, she was going to save her apples. I spoke to her this spring before the time came on, because I thought she might do it again. She said she did not care whether it killed my bees or not, she was going to save her apples. I said : " We have always been friends, and I do not wish to be anything else ; but if you will do it, I will have to do something to stop it, because it kills my bees in such large numbers." She did not like it a little bit. There should be something done to such people as those.

Mr. WALTON : The law is all right, but I think we ought to let them know the time to spray. If they do not know the time when to spray, and you try to prohibit them from spraying, they will begin to kick terribly. I should think pamphlets ought to be distributed through the country, and it would be a good thing for the bee-keepers or someone else to see that it was put in the daily papers, or put into the county papers all through the country. It will be a grand thing to teach people when to spray, because then they would not kick against the law, because it is not the time to spray when the tree is in bloom, as I understand it.

Mr. NEWTON : Speaking with reference to that lady, she said : " The sprayers told me I should do it when the trees are in bloom, and I am going to do it."

Mr. HALL : I relate an instance that came under my personal notice. Two years ago a certain lawyer, a Queen's counsel, was spraying his trees in fruit bloom, and when remonstrated with and told it was against the law, said, " Nonsense, it is not." I pulled out copies of the pamphlet which has been referred to and showed him the law, and he was surprised to find that it was the law.

Mr. A. STEWART, Canfield : A neighbor of mine was spraying against the law, and when told about it he said he did not care for law or anybody else. I said if he kept on spraying I would bring the law to bear on him. He did not care, he was going to spray. He was an ignorant man. These parties who are stubborn should be dealt with according to the law.

Mr. DARLING : The great difficulty we have to deal with is the fact they do not know. The agents of spraying pumps tell them to spray in bloom. I have thought that we ought to take it up in the proper time of the year, and have all the local papers publish an article giving the time to spray for the different pests, and above all things to emphasize the fact that under no circumstances should trees be sprayed when in bloom, because it injures the fruit.

QUESTION BOX.

The question box was opened by Mr John Newton, of Thamesford.

Q. What success, if any, are drone and queen traps at out-apairies ?

Mr NEWTON : I can only say that I have no experience personally on the matter, but I have met with some parties who use drone traps, and who were away from home during the day and came home at night and attended to their bees that had swarmed during the day, and I have been told they worked with very much success.

Mr. Dickson: I will give you a little experience myself. If you carry business on a large scale, and if seven or eight were to go off at once your drone traps would not amount to anything, and with a large apiary the queen-catcher would be troublesome, but the queen-catcher is a good thing other ways.

Mr. Post: I have had no experience with them.

Mr. McKnight: I have no experience, and the fact that very few have had experience seems to me to imply their employment does not commend itself.

Mr. Emigh: I have had no experience at all. I have no out-apiaries, but if the drone trap would get two or three swarms together that would be just what I would want. I want those big swarms.

Mr. Darling: Mr. Emigh, did you ever get your colonies too strong?

Mr. Emigh: No.

Mr. Darling: I have had them so strong that they would not work. I have had no success until I destroyed the queen and gave them a sheet of brood. Where they are so strong they are so very apt to ball the queen.

Mr. Emigh: Possibly strange bees coming back might ball the queen.

Mr. McEvoy: I have not had experience along that line at all. I think Mr. McKnight put the whole thing in a nut-shell, that if it had been of much practical value the bee-keepers would have been on to it.

Mr. Newton: I find in my own yard I like to have a drone trap once in awhile, and I think having one or two in the yard comes in very handy.

Q. What are the objects of contracting by division board?

Mr. Newton: The writer to this does not say whether it is spring or fall, or when. We have had a discussion this afternoon on the fall part of it and partly in the spring. I was surmising that he meant probably during the swarming time in connection with probably comb honey. He also follows with the following question: What are the advantages in clipping queens? So I would take it for granted that he was speaking of contracting in connection with the comb honey. I think it is a great advantage in the way I work, working for comb honey. I think that the swarms are the ones we get the nice comb honey from, and are the ones we get the most from, and by contracting them with division boards and filling up with dummies, we get them into such a space that we get our combs mostly all workers. By crowding them on five cards we get the biggest percentage of worker comb, and also crowd the bees into the sections and get nicer filled sections.

Mr. Post: I think it depends a great deal on the time the bees swarm whether you get the most or best comb honey. If you can keep bees from swarming together I think you can get far better honey and more of it. If they swarm two weeks before the main honey flow they will be the poorest swarms you have in the yard, and if it is a little too late it is just about the same.

Mr. Hall: That is something I would give fifty dollars to know. He might get on without swarming. His location is different from mine. I have tried his method, and it is good for many things: it ventilates the bees, it retards swarming, and they work better; but as far as preventing swarming with me I do not know that it prevents ten per cent. of them. I think it must be the location. As far as the contraction is concerned I want my bees to swarm right in the commencement of the honey season—not one day before. My hive is a large enough hive, and they fill that with brood, and not much honey. If they swarm from the first to the twentieth of June I want them on five starters for comb honey. We get a very small percentage of drone comb, especially if the queen is old.

Mr. McKnight: I asked the question, and I do not think anybody could have any particular trouble in discovering what the meaning of the question is. I have heard a great deal in my lifetime in thirty years' experience about divisions boards and contraction. I want to know if the use of division boards has any other purpose than that of conserving heat and confining bees.

Mr. Hall: I know of no other use than those two.

Mr. McKnight: I never use a division board, because I never was yet persuaded that a division board was necessary for either of these purposes unless the division board is perfectly tight.

Mr. Hall: We don't want them that way any more.

Mr. McKnight: Unless it is of that character it cannot conserve heat to any great purpose. I asked the other question that grows out of this. What is the object in clipping queens in a home apiary or any other yard where the bee-master himself is present? The only object in the world that I see of clipping queens is to control swarms, and to prevent the queen from flying away. I do not think it prevents the queen from being lost. I never clipped a queen, and therefore, I cannot say anything upon the various methods of performing that surgical operation.

Mr. Hall: I do not want the division board for confining heat. I want it during the swarming season if I am taking comb honey. I want it to contract the hive. Sometimes I want to raise five, ten, fifteen or twenty queens from one stock of bees that have swarmed, and to do that I pile a lot of brood combs into the same hives, and a few days after I cut out the cells and put one into each comb, and I put a division board in to make a hive. If you did not put that in, they would then build comb on each side, which you do not want them to do, because they generally build drone comb.

Mr: McKnight: Would not the removal of the unnecessary frames answer the same purpose to a great extent.

Mr. Hall: No. When you get busy a man cannot attend to these little things; and when you go back to it she has built three or four small combs, outside of the division board.

Mr. McKnight: I admit its use to confine bees, but I never could admit its use to confine heat.

Mr. Hall: With regard to Mr. McKnight's second question as to the advantages of clipping queens, I venture to say if I did not clip my queens I would have ten times the work. Another reason is, to know the age of the queen. I am working in my workshop where I can see the whole yard; I know may queens are all clipped, and when I see a swarm come out I am not in a hurry to drop my tools and run. Sometimes we have five or six out at one time.

Mr. Newton: I know it is a great saving of labor to have the queens clipped.

Mr. Walton: It has a great many advantages in my experience. You are not in a hurry when the swarm issues. You may be engaged in something else. I use some swarm catchers, and when I pick up the queen I put her in a cage and slip her on the swarm-catcher.

Mr. McEvoy: Mr. Hall has given the advantages of the division board, and I think Mr. McKnight will have to acknowledge its advantages. Now it is just as necessary to crowd these bees for outdoor wintering into smaller space. By crowding them up they cover the comb with the honey, and if the honey is warm and if we get Klondike weather it will not affect that honey.

Mr. Dickson: I use the division board pretty freely. I never heard people say that they use it to increase the honey crop.

Mr Hall: Mr. Newton and I use it to increase the worker comb.

Mr. Dickson: I used it to increase the extracted honey. Take a young swarm: I put in eight frames with two division boards. I look upon it that the honey goes up above; when the feeding time comes, to prepare for win er, which is the great secret of spring management, I pick out these two division boards.

Mr. McEvoy: How many frames do you use in your hive?

Mr. Dickson: Ten—We take out these division boards and replace them with combs of honey. In our locality there is a good flow of buckwheat honey, and these buckwheat combs are put in the place of these division boards, and I look upon it that we get more extracted honey, and more of the clover honey in the supers.

Mr. Hall: That would lead on to another thing. I have an out apiary nine miles out where we get a buckwheat flow, and we simply hive them as we would for comb honey, on five starters, and as soon as the white honey ceases we take out the dummies and put in sheets of foundation. We just simply divide two, and stick in three sheets of foundation for the bees to fill up with buckwheat honey for wintering, and they do it.

Mr. McEvoy: This gentleman has struck a very important point; the more honey that is stored below the less you get above, and if he contracted ten to eight he really went into business.

Mr. Shaver: Then, an eight-frame hive is better than a ten.

Mr· DICKSON : I find the eight deficient for wintering.

Mr. DARLING : With regard to making bees carry honey upstairs by placing division boards below, I was bothered with one of those queens that seemed determined to go away, and when I say the queen I think we should blame the whole stock of bees. I wanted to get some comb honey. I piled up supers, two, three, or four high, and they were not satisfied unless they would go. Finally I cut the queen's head off. They came out after that and fortunately, or unfortunately, they got a young swarm with them while in the air, and got mixed up with the bees that had the young queen, and I concluded if they would not do as I wanted them to do, I would see if I could make them do otherwise. I took one of those Jones' hives and filled up part of it with those dummies. I went to the hive the swarm had come out of, and I took off the three supers and carried it and put it on top of those three frames, and put the swarm in. After that time I had all the honey they gathered. It was a virgin queen, and she did not get to laying for some ten days. When I took the sections off there were three cards of solid brood from top to bottom, put in as pretty as ever I saw. There were not two pounds of honey in the hive.

Q. Foul brood is now better understood by the bee-keepers than when the Foul Brood Act was passed. Could it not be better cured and sooner exterminated by appoining a number of sub-inspectors, whose duty it would be to inspect every colony in their districts and attend to the curing of any disease found by visiting the apiary as many times as necessary.

Mr. NEWTON : I might say I have thought of this question a good many times. It seems a lot of work for our inspector to pass from one end of this country to the other and do ample justice to every bee-keeper in our country. We have talked it over in our Oxford convention. If there was one appointed in connection with our local conventions, I think the disease could be sooner done away with than it is. I know how it is with our friend McEvoy. He will visit some place in the west, and then he is away to the east. Sometimes he may not get back for weeks, and probably months. Well, we do not know whether that man is doing his duty or not. If there was a man in that district to see to it, I think the thing could be cured quicker.

Mr. MCKNIGHT : There is one point in connection with this which, perhaps, has been overlooked. In order to carry out the suggestion that has been made, the law affecting foul brood will have to be changed. There is nothing in the law now which would clothe a local officer with the necessary power to carry on the work.

Mr. MCEVOY : Sometimes I run up into a yard where a man has not done his duty, and is not likely to do his duty, and needs to be looked close to. If he has a mind before I go into the yard he can challenge me to produce the authority, and I have to show that I am legally and lawfully appointed, with the President's signature, or he can show me the gate and tell me to get. I have no power to go on any man's premises without the legal document. This fall I went to carry out the law in one place, and I was afraid I would be driven out, but fortunately I was not challenged. I was going to enforce the law very forcibly.

Q. Is it advisable to re-queen with virgin or young mated queens in order to diminish or prevent swarming, and with a view also of obtaining a large amount of surplus ?

Mr. NEWTON : I used to think at one time that if we could prevent swarming and keep our stocks from swarming we would always get the largest crop of honey. The last few years I have changed my opinion. I think that if the colonies seem determined to swarm, the sooner they do so the better, and then, when the swarming fever is over, I think they are in a position to give us honey. I have seen no advantage in what I have tried of re-queening or running virgin queens in to prevent that, because sometimes the hive is at the point of swarming when we undertake to do that, and putting the young queen in when the swarming fever is there won't prevent swarming.

Mr. SIBBALD : I do not think putting a young queen in will prevent the swarming, if they are determined to swarm. That has been my experience.

Mr. HOLMES : It seems to me that has changed the view of the question somewhat. Are we not supposed to give them the young queen before they get that determination to swarm ?

Mr. NEWTON : The question does not say that.

Mr. HOLMES : In reference to the desirability of having the swarm issue, in my experience I prefer to have the bees all in one hive. I would expect to get better results

from that than to have them swarm. I do not want my bees to swarm if I can avoid it. Of course, as to the effects of placing the young queen in in the spring to prevent swarming, I am not prepared to speak definitely, but I have experimented on that sufficient to give evidence, and the little experience I have had would be to answer the question in the affirmative, that it would hinder swarming.

Mr. DARLING: We try lots of things we do not know how to manage, and perhaps that was the way when I tried this re-queening business some years ago. I found sometimes they would not accept the young queen, and they would just simply wait until some of their own hatched, and I had a first swarm with a virgin queen. They would start a lot of queen cells, and would refuse to accept the queen I put in, and they came out determined to swarm. There was a good deal in the bee journals pro and con with regard to swarming some years ago, and I thought, like a good many others, that if I could keep the bees at home I could get a good deal more honey. It never worked. That which has given the most satisfaction is to let the bees swarm.

Mr. HEISE: I think the reason for Mr. Darling's non-success was the fact that he left introducing the young queen until the colony had made preparations for swarming. If he had introduced the queen early enough no doubt it would have had the desired effect.

Mr. HOLMES: I would like to emphasize the statement I have made, that at the beginning of the honey season I would rather have one hive full of bees than to have two hives half full.

Mr. HALL: They are stubborn things, and with me if they want to swarm, I have, of late years, never tried to retard them.

Mr. DARLING: Mr. Heise suggested that I was too late. I think that was one difficulty, but just there I have had a little experience which would not probably make it so sure if it was done earlier. I have had colonies swarm, and in the course of three or four weeks the prime swarm swarmed again. That, of course, was the old queen. I have had colonies swarm, the young queen hatched out, become fertilized, and went on and went to work, and in six weeks swarm.

Mr. HALL: Last year we had four cases of that kind.

Mr. GEMMELL: Those are exceptions to the general rule.

Q: Is it wise or unwise to allow the bees to clean out the combs after last extracting?

Mr. NEWTON: I would say yes. Of course, we all have different ways of doing this. We would not like to put away sticky combs into our storeroom after we have got through in the fall. Some put them on the hives again. I think from the tone of this that the questioner means not to change combs for fear of foul brood or something to that effect. But if he is afraid of that, put them on the hive again and have them cleaned, and if he is not afraid of that, why put them out doors and let the bees at them.

Mr. McEVOY: How far from the apairy would you put them?

Mr. NEWTON: I would not care if they were just about thirty or forty feet.

Mr. GEMMELL: What time?

Mr. NEWTON: I always put mine out in the morning before the bees fly; space them and have them ready, and in a couple of hours they will be perfectly clean.

Mr. McEVOY: I draw the line at any certain time, because if you lived in town or village just after the honey-flow you would start the bees in such a cross way that they would clean out all the cats or elephants.

Mr. DICKSON: I have experience in that. We always do it in the evening when the bees are all quiet—never in the morning. We carry them away from the yard possibly eighty feet. They kick up the first morning for possibly an hour or two, and after that those fellows know that road just like cattle to a well—no trouble in the world.

The PRESIDENT: That has about been my experience. I remove them probably eighty feet, or thereabouts, and after they get the road there they will go there, and I do not notice that they do much damage to cats or elephants.

Mr. NEWTON: As soon as they get started out, as our friend here says, they will make it a business transaction just as much as if they were going off to the field to work.

Mr. WOOD: Do you not find if they get it used up before night they are apt to get to robbing?

Mr. NEWTON: That has never been my case.

Mr. WOOD: To take it away through the day I find it starts them to robbing, or if they finish it up before night.

Mr. NEWTON: Do not understand me that I take mine away during the day.

Mr. WOOD: But if they have cleaned them up it is all the same as taking them away.

Mr. NEWTON: If they get through with the empty combs, and they leave them, then you can take them away safely at night.

Q.: What is the best way to do with combs having small quantities of honey in them in the fall?

Mr. HALL: I have not any time when I go down. It is about nine miles down; and I go down and pick off every super and pile it up where it is going to stay for the winter; and we keep them shut down till we get them all off, and then we simply put a chip or nail into the top piece and let the bees at it, and I tell you there is music, but we never had any trouble; we never had any robbing. I have to finish the job up. Sometimes there may be 150 pounds of honey, but they move it home pretty quick.

Mr. SIBBALD: Two years ago I did not get my combs all cleaned up, as had always been my habit, and I put them on next spring, and I found the bees rushed up readily into them and filled them right up, and I intend to practice that again. I would like to have the combs left with a little sweet on them, and the bees will go into them much more quickly in the spring, and if they are put on between the apple bloom and the clover this will be very useful in stimulating the bees, and it will save quite a bit of trouble, and I think it is an advantage to have them in that shape.

Mr. POST: That is all right if honey is coming in, but if there is no honey coming in, I will guarantee they will not go up and put honey in.

Mr. SHAVER: I have followed that practice two or three years, and my combs keep better and I never found them granulating.

Mr. MCEVOY: Suppose it does, the sieve catches the granulated.

Mr. NEWTON: If you have some buckwheat honey—

Mr: SHAVER: I never have any buckwheat honey.

Mr. GEMMELL: I want my combs clean, because very often if left in that way it granulates.

Mr. NEWTON: We very often get inferior honey in the fall.

Mr. WALTON: When the extractor is used to the combs is it any detriment to the combs to leave a small amount of liquid honey in them?

Mr. GEMMELL: I do not want to put my extracting combs down in the brood chamber; they will clean it out if it is granulated down there if they get a little water.

Mr. MCEVOY: If they are stored in a proper place they will do no harm.

Mr. SHAVER: After basswood flow with us we hardly ever have much honey of any account. They put in maybe three or four combs a little patch; I extract them and never dry them, and they are not badly mussed, and there is always a little honey, and I find the bees go to them next spring.

CANADIAN HONEY.

A discussion arose as to whether it would be possible and advisable to withdraw what had been done towards forwarding a honey exhibit to the Paris Exposition, because it was felt that the bee-keepers of the Province would hardly be able to do justice to themselves, as the honey crop this year had been so poor. It was decided that it would not be advisable to withdraw, now that the matter had been proceeded with so far, but the bee-keepers would endeavor to obtain consent to replace the honey, which had been sent, with samples of next year's crop, which it was believed would be much better in quality.

AFFILIATED SOCIETIES' REPORT.

There have been eight county Societies in affiliation during the present year, as follows: Russell, Halton and Peel, Haldimand, Norfolk, Oxford, York, Glengarry, and Brant. Each Society received a grant of twenty dollars, and these grants have been expended as directed by the by-laws governing such expenditure.

The reports of the increase of bees and the production are not as full and satisfactory as usual, two Societies (York and Norfolk) not reporting.

	Colonies, Spring.	Colonies, Fall.	Honey, Comb. lbs.	Honey, Ext. lbs.
Russell Co. Association..	184	267	2,450	6,310
Halton & Peel " ..	1011	937	...	7,500
Haldimand " ..	414	414	20	6,270
Oxford " ..	621	699	4,234	15,465
Glengary " ..	540	685	....	7,400
Brant " ..	338	400	975	10,150
	3,108	3,402	7,679	53,095

Average extracted honey per colony, 17 1-12 lbs.

Average comb honey per colony, $2\frac{1}{2}$ lbs.

Average increase in colonies, about $9\frac{1}{2}$ per cent.

These averages show a very poor yield of honey, and we take it for granted that if all the societies had reported the average would have been less.

W. Couse, Secretary.

DIRECTORS' REPORT.

The Directors' report for the present year differs from former years in that one cannot report a prosperous season generally over the Province, and also that we have to report the death of one of our number since our last meeting. We are sure the friends of Mr. Hughes will have your deepest sympathy.

The general business of the Association has been fairly well looked after, but owing to the severe and protracted illness of the Secretary, some matters have not been as well attended to as we could wish, the chief difficulty being want of experience.

The sum of $200.00 was set apart for affiliated Societies, of which $160.00 was paid to eight societies, that being the number affiliated.

The usual grants of $25.00, $10.00 and $10.00 were made to the Toronto Industrial Exhibition Association, the Western Fair Association of London, and the Canada Central Fair at Ottawa. These grants were expended in accordance with the law.

The *Canadian Bee Journal* has been sent to each member of the Association. They have also received a copy of the annual report.

We are pleased to be able to report our finances in good condition, there being a balance of about $116.84 in the hands of the Treasurer.

All of which is respectfully submitted.

INSPECTOR OF APIARIES REPORT.

During 1899 I visited bee yards in the counties of Haldimand, Norfolk, Middlesex, Oxford, Brant, Wentworth, Lincoln, Wellington, Halton, Peel, York, Ontario, and Simcoe. I inspected one hundred and twenty-six apiaries, and found foul brood in forty-seven of them.

In places where I had never been before is where I found nine-tenths of the foul broody apiaries the past season, and over three-fourths of the owners of these diseased apiaries did not know that their colonies had foul brood when I first visited them. I

took the greatest of pains to explain to the bee-keepers how to manage the business so as to have every colony a good strong one, and in fine condition, when they were cured of the disease.

In looking back over the nine years that I have inspected the apiaries of the Province of Ontario, I noticed that I had found foul brood very widely spread through thirty counties. I succeeded in getting thousands of foul broody colonies cured and the disease driven out by wholesale, and peaceful settlements made *in every case* where diseased stocks were sold through mistakes of the parties selling, not knowing of their colonies being diseased at the time of sale.

Nine years ago very few of those that kept bees then were able to tell the disease from other kinds of dead brood, and not over half a dozen men in Ontario could cure an apiary of foul brood, and end the season with every colony in first-class order. The instructions that I gave while on my rounds through the Province, and the driving out of the disease by wholesale, will make Ontario one of the safest places in the world to keep bees in.

Mr. F. A. Gemmill, of Stratford, is the man that deserves the credit for all the work that I have done, and the Government of our country that has paid for it. In 1890 Mr. Gemmill took hold and worked hard until he got the Foul Brood Act passed, which has proved to be a great benefit to hundreds of bee-keepers.

I am greatly pleased with the way the bee-keepers took hold in the past season and cured these apiaries of foul brood. Where I found a few worthless colonies almost dead from the disease late in the fall (and near fine, sound apiaries) I burned them. The total number that I burned in the Province was twenty colonies, after the owners and I had reasoned out things nicely together.

For the courteous and very generous way that I have been treated by the bee-keepers of every locality that I went into, I return my most heartfelt thanks.

My time, car fare and livery hire, $734.30.

Wm. McEvoy.

Woodburn, Dec. 4th, 1899.

Mr. Holmes : In order to place the subject before the meeting I would only say that I think I would be voicing the desires of the meeting in saying we have all confidence in our Inspector of Apiaries ; he does his work well, without fear or favor, and I would move the adoption and endorsation of Mr. McEvoy's report.

Mr. Newton : I have great pleasure in seconding Mr. Holmes' motion. I believe our Inspector has worked faithfully, not only in this season but in past seasons.

After several members had expressed their appreciation of the work Mr. McEvoy had done, the motion was carried unanimously.

BEE-KEEPERS' ASSOCIATIONS : THEIR PAST, PRESENT AND FUTURE.

By W. Z. Hutchison, Flint, Mich.

The time was when a man who owned some bees would walk a mile or two to see an article "on bees" in some paper. The time was when a bee-keeper would come home from a convention fairly loaded down with the new things he had learned. If the wives of the bee-keepers who now attend conventions should ask their husbands upon their return what new things they had learned, I think some of them would have to scratch their heads before replying. The time was when the principal feature of any association was the dissemination of methods for managing bees. This is no longer true. The social pleasures are now the paramount feature of a convention. Perhaps no one has admitted this ; but look deep into your heart and see what answer you find to the question, "Why did you come?" Editors of bee journals and the supply dealers may go to a convention to further the interests of their business, and it is entirely proper that they should, but the producer of honey comes mostly, principally, and all the time "to see the boys, and have a good time." I will admit that many things in regard to the management of bees for profit are still learned at conventions ; and these gatherings would still be as valuable for this purpose now as in days of yore were it not for the great number of most excellent

and low-priced journals devoted to the business. No sooner does a bee-keeper make some discovery than he reports it to his favorite journal; the other journals copy it; and by the time that a convention meets there is nothing new to talk about—it has all been told.

But the social feature of a convention is not to be sneered at. The friction of mind against mind, this rubbing up against our fellows, brightens us, sharpens our wits, gives us broader views, and makes us better bee-keepers and better men. Then, there is the pleasure of it. This life is not simply a life of dollars and cents. At least it *ought* not to be. The man who has worked at home all summer owes himself and his wife an annual outing with kindred spirits.

From a business point of view the usefulness of bee-keepers' associations in the future will be the accomplishment of those objects that require united action—those that bring to mind the motto: "In union there is strength." Associations can accomplish things that are beyond the power and purse of the private individual. See what legislation has been secured for bee-keepers both in the United States and in Canada, through united action—through association. Foul brood laws, laws against the spraying of trees while in bloom, laws against adulteration of honey, the protection of bee-keepers in their right to keep bees, lower freight rates, etc., have all come from association. The Bee-keepers' Union stands ready to defend bee-keepers in their rights, to assist in the passage of needed laws, to prosecute adulterators, to help its members in any way wherein is required united action. United action, in the shape of exchanges, has done much for bee-keepers in the way of buying supplies and selling honey. It is in such directions as these that lies the work of associations in the future.

Mr. Hall: I think Mr. Hutchison's paper is a very valuable one. It tells us things we know and gives us a hint of what we are doing and have to do. Of the methods of bee-keeping in the past, of course, we have learned a great deal in conventions. The reading of journals is all very well, but we get no debates in them, and I think all the instruction we get at the meetings of this Association is practical instruction for the young apiarist. I think these conventions are beneficial to them in the instruction they may get from the older heads. Last night's discussion would have been worth twenty dollars to me when I started twenty-four years ago. When I commenced bee-keeping we had no bee journals. We had what was called a bee journal, but the management did not know what they were writing about, and they put us on the wrong track, and we lost money. At a convention if you do not understand what a man says you can button-hole him and ask him to explain it. It is a great benefit to the young men in this Association who are just starting, or have started, or intend to start, to have the practical old heads hit each other pretty hard knocks in good humor. The Association has been successful in obtaining a foul brood law, and this I feel is important to the country. We have also succeeded in obtaining a law against spraying, although it is not enforced as it should be. And, in respect to the adulteration of honey, if we report the adulteration to the Government, they will see the offender punished. We know we had a pretty good time yesterday afternoon in the social part. Sometimes the old heads get ideas from the young men, but for the old and young our present associations are doing a work, not to amuse only but to give men a chance of knowing and encouraging each other in their work. As far as prosecuting bee-keeping in the future is concerned I cannot say anything about it. I think in the future it will go on as it has done in the past and is doing in the present. The young fellows will come to take our places; others will want information, and they will simply do the work we have done with the assistance we leave behind. We leave the property to them, and they can go on and impart what they learn themselvee to the younger ones coming up, and I think the association work should be carried on for that reason.

Mr. Dickinson: I think there is a good deal of truth in the paper. and there is quite a bit of truth in the remarks made in connection with it by Mr. Hall. We might think we know all about bee-keeping, and there is one advantage in coming to these conventions that we find out we do not know it all, and that there are other men who know just as much as we know, and perhaps more, and from whom we can learn something helpful to ourselves.

Mr. Dickson: I like Mr. Hutchison's paper. There was one slight hint about our coming to these conventions—do not call them conventions at all, call them bee-meetings—

where we learn something about bees. That was the hint in regard to taking away information. I believe that is a fault with a great many of us. Something was said about scratching our heads when we get home and wondering where the information was. I I remember one man coming home last summer, and he said, "I do not know that I will attend our meetings again; when I get home I cannot remember anything." "Can you read and write?" "Yes." "Why not take notes?" When we attend our meetings we should take notes. I learned some good things here yesterday afternoon, and I am taking notes of things that I think will be helpful to me. Another good thing hinted at was the running to the journals when you find out something new. That is a mistake. If there is anyone who finds out anything new he had better try it pretty hard, and give it the fullest test, and tell us about it then. It has been the means of flooring many a one in the bee business by trying some of the things that came out in the journals. Sometimes we think we have found out something that was not really a success at all. I think we should encourage the ladies to attend, because—whether it is a fact or not—I give them credit for taking in more than we men do. I find it very hard to keep my wife at home when there is any other good work going on in the line of attending meetings.

Mr. Newton: I am sure I have always looked forward to our conventions as a pleasure, but I have always looked forward to having a profitable time. I like to meet the boys from winter to winter and spend a good time with them, but I always think of taking something home with me, and I generally do, that has been of profit to me during the convention. I believe the same in the bee industry as in most of the other societies—unless we keep in touch with each other in the different ways of working we will never make a success of our business.

Mr. McEvoy: I think if we could tell of the mistakes we make as well as of the successes we have had it would be a sort of guide to others not to go and do as we have done.

On the motion of Mr. Pickett, seconded by Mr. Craig, a vote of thanks was passed for Mr. Hutchison's able and valuable paper.

MARKETING OF EXTRACTED HONEY.

By H. G. Sibbald, Cooksville.

My experience in marketing honey may not be as great as that of many of you, but, as you know, I am not altogether responsible for being in the position you find me; therefore need not apologize. After having secured a crop of honey, it is of the utmost importance to the experienced bee-keeper, and not a little concern to the beginner, to market his product so as to have the largest return in dollars and cents. With this end in view, then, let us be sensible. If a large crop has been obtained, do not tell everybody about it; do not publish it in every journal you know of. If you do it will have a tendency to lower the price of honey, increase the number of bee-keepers, and, of course, cover you all over with glory as the greatest bee-keeper on earth.

Next, do not be in a hurry to sell your product. Wait until there is a demand for it. Occupy your time finding out all you can about crops in other locations. Take into consideration the fruit crop, and anything else that will affect the price of honey. Make up your mind to have a fair price, and do not get faint-hearted when the dealer tells you about the big crops of honey in California and the rest of the earth. Be in a position to jolly him about how scarce it is here and there; but if he wants honey he will soon talk business, and you will get your price.

After the small fruits are out of the market the demand for honey will commence. Supply your local trade first with a good article, selling at a fair retail price. See that the grocers in your nearest town or city are supplied with an assorted stock, say half pound jars, one pound jars, two, three, five, and ten pound tins, also some in bulk all nicely melted in liquid form. Charge them twenty per cent. less than retail price. If you have still more than this trade will be likely to handle, sell it to the wholesale commission merchant at ten per cent. less than grocers' prices, or look for an export trade.

Then there can be no cutting of prices, and all will reach the consumer at an even price. Be honest, give good weight, more rather than less If you sell by sample let the sample be a fair representation of your product, and that of the very best quality. In fact, make your customer's welfare your own, for the more he can sell the more you will be able to supply him with.

It was not my intention when I promised to read a paper on marketing extracted honey before this convention to go much into detail, but rather to place the matter before you with a view to organization of bee keepers for the purpose of selling their product so that an even and fair price might be maintained, and also that our honey might be distributed more evenly over the Province, and shipped abroad in a conservative and business-like way. As we are marketing our honey at present, if a man in England wants 25,000 lbs. of honey he would not know who to apply to for it. Only a few months ago a Winnipeg man wanted 10,000 lbs put up in 5, 10 and 25 lb. tins, naming a certain number of each. I could not direct him to any one who would be likely to supply him. This ought not to be so. We ought to have a place where a reasonably large stock of honey is carried, and where dealers at home, as well as in other countries, could apply with a reasonable assurance of having their demands supplied. Business is being carried on in quite a different way from what it was twenty or even ten years ago. Now, large large business concerns are amalgamating, trusts are formed, companies seek monopolies, large departmental stores have sprung up and are flourishing. What does this mean? I believe it means that the old adage, "Competition is the life of trade" is recognized to be the death of the trader, and that people have more faith in combination being the life of trade; and for my part I feel that if bee-keepers had an organization and headquarters for honey distribution, a bureau of information concerning honey crops, we would fare much better than we do, going it blind as it were, cutting prices on one another, selling our product through commission men who do not know clover honey from buckwheat, or basswood from bug juice, and whose only aim is to get rid of the consignment, get their commission, and be ready for another lot. One season those who sent the honey to the west did well; the next season everybody ships west and the market is glutted, prices down, bee-keeper disappointed. Another season very little is shipped to that market, not enough to supply the demand. One year shipments are made to England that pay well; another season when we are short at home and England well supplied by countries that were short the year before, we make larger shipments and come to grief. Can the members of the O.B.K.A. do anything to improve our condition in this respect? I believe it can, but will leave that for discussion.

The President: We have had a very interesting paper, in my estimation—one that is worthy of consideration and attention. Anything that commences to affect the public is worthy of note.

Mr. Newton: I am sure that it is a pleasure for me to be down as starting the discussion on the paper which we have had before us, because it is a very able paper, and there is plenty of room for discussion. The best recommendation we have for selling honey is to produce a good article to start with. If you sell a good article, and people buy once, they will usually buy from you again. If you sell something that is watery you do not often sell the second time. (Shows some samples.) Here is a sample which was taken unripe; you can see how soon it has granulated. This one is a ripe sample. The unripe will granulate far sooner than heavy-bodied honey. With reference to that thought concerning the Guild in our Oxford Society, we had talked over the formation of a Guild very much, and last spring it was the subject of one of our half day discussions, that we might collect honey together and secure a better way of getting rid of it than in the past. I know there are lots of things to contend with. We cannot get all bee-keepers to think of this point, because they would not attend bee-keepers' societies nor take bee journals, and if you try to persuade them they can get better prices by waiting a little longer, they will say, "We will do what we think," and when we come to sell we find the price is down. I think if we had small societies formed into guilds it would be beneficial. I do not believe in combines very much, but this seems to be the day of them at least, and I think we could get rid of our product to better advantage and divide it more equally than the way it is being done at the present time. As to cutting prices, it generally comes through those men that have a few hives of bees and who are afraid it

is going to spoil, and never think of waiting until they find out the demand for honey, but rush to the market and sell it. If these people would only wait a little while until prices were fixed I think it would be more satisfactory to bee-keepers in general and to themselves also. Do not rush on the market before the demand for it comes. Then we do not want to blow our own horn too much for fear people think there is such a large crop. I remember some years ago coming into a store in Woodstock and speaking to a grocer. It was a year when there was not very much honey and I gave him my figures. "It is too high altogether." I said, "Friend, there is not much honey in the country, and in a month or six weeks you will have to pay more for it." He commenced to jolly me, and I said, "Who gave you your information?" "Oh, the traders' report; they tell us everything." He would not buy from me. Three weeks after he wrote to me to send him 25 cases, and I sent my prices with an advance of ten cents a case, and he took them. Then we must look after the different crops of fruit, and govern ourselves accordingly. If fruit is scarce honey must come in demand to take the place of the fruits. As far as the local trade is concerned, I have alluded to that before, at other conventions. I think it is the main thing to look after our own home markets and keep them well supplied with a good article and not cut prices, and always give good weight. It does not pay to give short weight in anything. For the local trade I think the glass is more suitable, and in the liquid shape. For my own trade if they keep honey and it begins to granulate, I take it home and liquify it for them gratis; glad to have the opportunity to do so, because I think it pleases customers far better in the liquid shape. We are trying to educate them, but we cannot do it very fast. We ought to do what we can to please our customers.

Mr. Darling: I feel somewhat interested in this discussion. One thought I have is with regard to the cutting of prices, and I do not know that we can get over that difficulty. I believe co-operation among bee-keepers would work as well as among any other class of individuals; but we have found, and we think we always will find, there are individuals who are a law to themselves. There was an old gentleman, a member of this association for two or three years, and he was in my house one day. I said, "You sell your honey too cheap"—and he did not bring a very bad article of honey into town, although perhaps not as nicely handled as a good many others. What was his answer? He says, "You fellows have got the honey and you sell it; they do not know anything much about me, and if I do not sell my honey cheap then I cannot sell it at all." There was one time we had better prices than now. I sold at ten cents, and I found other people were selling at nine cents. I had a pretty good supply, and I sold at nine cents, and then the parties sold at eight cents. Where will this go? As soon as they get our prices they will go and put it in a little bit under that. I fully endorse what Mr. Newton has said with regard to liquifying honey for the local dealer. I had an experience which I will relate: I sold some sixty-pound tins, and one man told me one tin was not as good as the other. I looked at it; it was really dark near the bottom. "What have you been doing with it? That is burnt." He said, "I will tell you; it got hard and I took it home and put it on the stove to melt it, and I put a little water in it because I thought it would burn, and after it had got melted up I was afraid it was too thin and I put a little sugar in it." (Laughter).

Mr. Newton: That just brought one thought to my mind. We had a gentleman at our Oxford convention this fall, and he was telling us about the thickness of his honey—I think it went 14 pounds to the gallon. Of course he thought he was giving too much weight for the money, and we tried to advise the man that was the best way to do it, as it would always hold the market. He had been experimenting and putting water in and trying to thin it down. I think the advice he got at our Oxford convention convinced him on that point. Then, as Mr. Darling says, the grocers are not bee-keepers, and they do not all know how to liquify extracted honey without burning it.

Mr. Pickett: This is a thing that ought not to go out without explanation. The grocers will be placing your honey on the scales and it will not weigh fourteen pounds to the gallon. We must be careful not to put an estimate on our honey that one half of it will not reach. Our good friend is not saying anything so terribly amiss, but it is the effect that may follow. He knows as well as I do honey does not average that. As to this paper on marketing honey, I believe it is one of the most able papers that has ever-

been presented to this Association. I think our young friend is making his mark. I have been many years a bee-keeper and I speak from experience in this matter of selling. There are a few things we need to do: first, we need to be strictly honest. If a man asks you if you have ten thousand pounds of honey, if you have say so, but do not say it in such a way that it will be heard right down to Toronto. If you have a poor crop, say it in the same manner.

Mr. HALL: I am sorry the last speaker spoke as he did. He is a man I respect very highly. However, let me advise young and old never to offer for sale, except to a manufacturer, any honey that does not weigh fourteen pounds to the imperial gallon, or twelve pounds to the gallon, wine measure.

Mr. PICKETT: That gentleman is correct in his statement, but in the honey business most of us have been handling wine measure.

Mr. HALL: Then twelve pounds to the wine measure is very good honey, and if it is less than that it has something wrong with it, and we should let grocers know that twelve pound honey, wine measure, is good honey, and twelve pound honey will keep for years. I think good honey should be fourteen pounds to the imperial gallon, or twelve to the wine measure.

Mr. DICKINSON: I consider this one of the most important papers in connection with the bee industry, and hearing it read takes me back to two years ago, when the matter was being discussed of what we were to do with our surplus honey. I think the present state of affairs in connection with the bee-keepers generally through the Province has greatly changed since 1897. At that time, I think, we had a pretty good crop, and expected a very large crop the next year; therefore, it made us discuss that. If we have a large surplus it means the price must be low, and I had an idea at that time, 1897, that we might be able to put some honey on the British market if we could once establish there a reputation for Canadian honey. I had the opinion of a friend in Liverpool that there would be a very large demand, as the British people, when they give an order, give a large one, and I thought it would make a wonderful difference with regard to the amount of surplus we would have if we could once establish ourselves in the British market. With regard to how to market extracted honey, I undertook to try what could be done, as far as Canadian honey was concerned, in that market. I had letters in my possession that would discourage Canadian bee-keepers with regard to what Canadian honey would do there. However, I sent over my samples to my friend, stating when a man undertook to find new markets he must be prepared to take all chances, and I was prepared to let my goods speak for themselves. In 1898 I sent over a nice shipment. I was advised not to send less than thirty thousand pounds as a trial shipment. My friend said, "Do not send less than twenty-five cases." I sent that. I was very well pleased with the results. He has kept me posted with regard to what the market price is there, that is for California honey, and I think as far as my information goes at the present time that that is the honey the Canadian has to compete with in the British market. It is just as important in connection with marketing extracted honey to keep posted with regard to the markets of the world. I think you want to get to know pretty nearly as much as they think they know over there. No doubt you will be told there are large crops in Chili or California, which would have a tendency to make you be satisfied with a low price. I think a bee-keeper who is putting honey on the foreign market ought to be ready to take what the market allows in competition with the world, because if there is a large crop in California he certainly will have to take less for Canadian honey on the British market than if there was a small crop there. I have in my possession a letter which would satisfy any bee-keeper in Ontario how we stand in respect to quality. I will read it for the benefit of the members of the Association. This is just in two years. It is not necessary for me to tell the bee-keepers that it is imperative to send a good article. It is always necessary to sell a good article of honey even in your home market, and it is more important to send the very best clover honey into the British market.

"I have pleasure in sending you account sales for 78 cases of new Canadian honey, with draft on the Bank of Montreal, Hamilton, for £176.4, net proceeds of the same. I hope the result will be satisfactory. I sold it net cash terms, the buyers paying landing charges, namely, dock and town dues, master porterage, which makes the price about 47s. 6d., no other lot having brought so much. The highest price paid so far this season is

46s. 6d. The buyers are very much pleased with the quality, but thought we were rather stiff in the price. They expressed their regret, however, that they are not able to get more. Should you be able to get any more of equal quality, that you can ship at the price, we would have no difficulty in placing it. We hope there will be a larger crop next season, and, if quality is maintained, you will have no difficulty in getting a price equal to the best on the market."

I do not think we can for a moment imagine we are always to get high prices for honey in the British market, because supply and demand nowhere more affects the market. This friend sent me samples of Chilian honey. He had made a sale of three hundred barrels of Chilian honey. As soon as I tasted the honey I found my honey does not come up against that class of honey at all, and he would have to sell it for half, and he did sell it for 23 shillings. On the other hand I have a sample of California honey, and found that honey to be a superior honey to the Chilian honey, and it goes right up against first-class Canadian honey. Therefore, it will depend a good deal on what is their crop in California. I do not know so much about other foreign countries, but I know Chilian honey is an inferior article. Therefore, it is quite necessary to be posted on what the California market is before we can expect any great things. We will be governed by supply and demand in that matter. I think it is necessary for some of the largest bee-keepers in Canada to find a new market, and let the smaller bee-keepers get the benefit of the local market, and also keep the local market supplied all the time. By doing this the prices will be better all round. In good seasons we must ship out our surplus honey.

EXTRACTING WAX.

By Mr. J. B. Hall, Woodstock.

Allow me to introduce this talk by saying a little about myself. We tried the solar wax extractor, the Swiss extractor, the boiling and skimming process, and so on. All these things were slow and mussy jobs, and I thought I had pretty near all the wax out of some old combs I melted down. Mr. Gemmill was telling me how much more wax he got out of the refuse he had thrown away, and I thought he was mistaken. He was confident that I was wrong, and said, "I will send the machine down and you can try it." So, I said, "All right." His son, about 20, came down with the machine, and we had some refuse from the Jones extractor and the sun extractor which he saw lying in the yard, and which had been there eighteen or twenty months in the snow, frost and dirt, and the boy wanted to show off the qualities of the extractor and suggested we take that. I said, "All right." He melted it down, and he says, "You see the wax there?" "No." He got a kettle of cold water, and he took out the boxes. "Now, sir, do you see the wax?" "Yes." "You thought you had got all the wax out of that?" "Yes." "Do you believe that you had now?" "No." So, then, we tried after that some very old combs about eighteen or twenty years old, that had been used for brood purposes, and those I weighed, and I got $3\frac{1}{2}$ lbs. and a trifle over, which I thought would have to be deducted for the soil or dirt. That was out of the one hive of old comb. That satisfied me. I have tried it considerably since then, and it takes out about one-third more wax than we can get out in any other known process that I have tried, and we take it out with less trouble, and I think I can take out eighty pounds a day. I have taken out forty-five pounds just part of the morning and part of the afternoon.

Now, as to the way to do this. (Explains with aid of extractor.) We first melt our combs in a pan on the stove, cutting the comb out of the frames and put it in here, and we melt one hive at a time; and we keep stirring it with a ladle. We have a kettle of water first put in, and there is a spout here so that the water can run out, and then we have this large canvas, which should be very open. We pull the pan out and spread the canvas on the pan. We stir the wax until just before it begins to boil, and then pour it on to the canvas in the pan. The water will begin to run into the pan. We then gather the canvas from the four sides so that it will be like a bag. Then we put the block on and screw down the screw. You will notice the arm of the screw is moveable, so that you can get a good leverage. When we get the block down we wait a moment be-

tween the last few turns of the screw. If we are in a hurry we pour a pail of water in, but afterwards you have to pour in a pail of hot water. We then take out our block and put it by the stove to keep it warm, and pull out the canvas and shake out the refuse in the canvas. We can get three packs of refuse in one day. One thing about this wax is it is very soft and pliable, not harsh and brittle. The cost of the machine is trifling—about $1.50. I have been saving my own combs until this winter. I am going to melt up sixty supers of comb, because I can get wax and give foundation in return. If it was not for this machine we would simply use them for extracted honey.

Mr. HEISE: What percentage of water do you add to the old comb?

Mr. HALL. It makes no difference. The more water you have the easier it is to get it out. I have my boxes two inches deeper than the box of this extractor.

Mr. MCEVOY: Do you think you would double the wax that you would get out of the Jones steamer?

Mr. HALL: One third more, with one sixth the trouble.

Mr. J. D. EVANS: Do you use it in the first instance, or for the refuse of the other extractor?

Mr. HALL: In the first instance. It would not pay with the refuse of the other extractor. I made one this summer, and made twenty-eight pounds of the refuse of what I usually throw away.

Mr. MCEVOY: You made foundation from the wax made from them?

Mr. HALL: Yes, sir.

Mr. MCEVOY: Did you notice any difference in that wax sagging more than the ordinary wax?

Mr. HALL: I cannot answer you that.

Mr. MCKNIGHT: Suppose we used a screw, such as used in ordinary cider mills, would we get more wax?

Mr. HALL: I do not think you would get more wax, but less labor. You get a better sample of wax with this extractor, but it is soft. I do not know whether that is against it.

Mr. CHRYSLER: In regard to soft wax, I do not think there is any supply dealer or comb foundation manufacturer that will object to the wax on account of it being soft. They can get it so that it won't be too soft, if necessary.

Mr. HALL: You can counteract that?

Mr CHRYSLER: Yes; it is easily got rid of.

Mr. MCKNIGHT: Suppose low pressure was employed to harden, do you think the foundation itself would be as strong from that wax as from ordinary wax?

Mr. CHRYSLER: It would be making foundation improperly to do so.

Mr. HALL: I know for sections the bees accept it quicker than they do hard.

Mr. DICKSON: Is there any one here has had any experience in using foundation wax from that machine?

Mr. HALL: I don't know as to that. I know it was all right in cool weather. (Turning to Mr. Newton.) Do you know whether foundation made from this machine sags?

Mr. NEWTON: I could not say. I only say I could not mill it at the same temperature as I could mill harder wax. I was speaking to a gentleman and his experience was similar to what mine has been.

Mr. MCKNIGHT: What is the cause of it being softer?

Mr. NEWTON: I once thought probably the pressure on it. Whether that has anything to do with it, I don't know.

Mr. MCEVOY: If that wax is taken and put through the Weed process you would find that foundation from the Weed process would be a great deal tougher, because it is made on the principle that the more is it worked the tougher it is.

Mr. CHRYSLER: The Weed process and this process is not to be compared at all. The Weed process deals with the grains of wax, and this with the wax itself. It will squeeze out more of the very, very fine dirt, and there is some of that incorporated with the wax and by re-melting in the way I do in refining my wax you will get it just as good, and the same texture as any other was I ever got. I have tried this same process a little different to what has been tried. I have used probably one half barrel of water so that my refuse would go in nicely before it is pressed, and the product I had was very

light in color, and as far as texture goes it was no softer than the average run of wax. The greater quantity of water I used I account for affecting the softness of the wax.

Mr. NEWTON: I think, as far as its use for foundation is concerned, it is just as good as the other.

Mr. HALL: I find no difficulty whatever in milling and no difficulty in sheeting. Whether it would stretch with full sheets in the large frames I do not know; but for foundation for sections it is just the wax. It has a better smell.

Mr. McEVOY: All wax made from old comb is softer than in capping.

Mr. HALL: Then, this has nothing to do with the sagging.

Mr. DICKINSON: Would wax that I would take from old combs with this process sag any more than the wax from the same combs with the other process?

Mr. McEVOY: I do not think it would.

Mr. SHAVER: Your wax will be a little softer.

Mr. CHRYSLER: All wax will sag to a greater or less extent with the bees working it. The grains are just as good in that wax as in any other, and they will not slip past one another.

Mr. DARLING: With regard to softness and hardness of wax, take wax from a solar extractor, and it is harder than that rendered by either steam or water. Mr. Chrysler, over there, says he can manage the wax even if it is soft. I suppose he is one of those who melts his wax dry. Some say never let a drop of water touch it. If this wax is likely to be too soft, for either one reason or another, I would advise people to have a solar extractor, and use it to have this hard wax to mix with the soft. There is certainly an advantage. If I had 500 colonies of bees in five yards, and had a press like this in every yard, I would have a solar extractor in every yard.

Mr. McKNIGHT: Do you know why wax from old combs should be softer than capping?

Mr. DARLING: I do not know.

Mr. CHRYSLER: I did not say how I would fix this wax to make it suitable for making foundation, and Mr. Darling has supposed that it would be done by melting with a dry mill on making the foundation. If I found any I thought was too soft in that manner I would melt it up by steam in the way I refine wax; I would thoroughly refine it, as I do ninety per cent of all I use. There is no more than ten per cent. of wax that I get in but what is thoroughly refined by steam and a small quantity of acid. I then get it as near perfect as I can generally see wax by that way, and it then is melted for foundation dry and kept so until it is thoroughly done.

Mr. DARLING: Then we understand that all wax that is refined by the acid process is harder for being refined.

Mr. CHRYSLER: This propolis, or pollen, or dirt, whatever it may be, that causes this softness, that process will remove; and we do not care very much what it is from as long as we can successfully treat it.

Mr. DARLING: That is, the effect of refining with acid makes the wax harder?

Mr. CHRYSLER: Oh, yes; that is, where it is too soft, but where it is real hard I have not found it to make it appreciably any harder.

Mr. McEVOY: Because it is softer wax that is no detriment to it, because bees will use it up quicker; the only detriment is in sagging, and that is easily got over by using wire.

OUR OWN AND FOREIGN MARKETS FOR HONEY.

BY PROF. J. W. ROBERTSON, DAIRY COMMISSIONER, OTTAWA.

This is the one Association with which I have had least to do of all the associations of men in Canada who are working for the development of our natural industries. So I came more to learn than to give you information. However, I must say this, that I recognize that the bee-keepers of Ontario have been doing capital work, not merely for the commerce in bee products, but for the people of Ontario, who have been improving their farms through growing clover. That is outside your business, perhaps, but I know a good deal more about clover than I know about bees. Then, I recognize this further, that one of

the main means of improving the status of farming in Ontario to-day is through the growing of clover crops. There is no means now whereby the fertility of the fields in this Province can be renewed economically except by growing clover. I need not detain you with a talk on farming, but I will mention one experiment conducted for thirty-two years with the growing of clover between grain crops, and the average yield was 114 per cent. of grain more where clover went between the grain crops. That is thirty-two years work in one of the fields of England. That is not a little thing; it is one of the big things of the Province to grow clover. It is not always possible to get the clover into blossom as pasture for bees, but many of the pastures in Ontario would have more food for bees of various kinds. You cannot grow clover seed without the fertilizing action of the bees on the blossom, because where clover plants have been screened in from bees the seeds do not form, because the germ is not fertilized by the pollen at the right time and the right way. I will speak a little this afternoon on the home and foreign markets for honey. I have watched the home markets a little bit, because I have to, in looking after the markets for agricultural products, and I learned that in Ontario and in other places in Canada there is a very large market that is not nearly met by the products that are in abundance in the country. I think one of the best markets for honey is what I would call not merely the home market in Ontario, but the personal house market. Honey is one of the things for which every housekeeper will pay a bigger price direct to the producer than any other way. Just a word as to the essential difference between the personal house market and the general market. There is a general market for wheat, and by the very greatest of care a man can raise about two cents to the bushel. In the personal house market anybody can raise the price fifty per cent. in any product. We pay thirty cents a pound at the house for butter —paying twenty five cents all last summer to a woman who brought it from her house in the country. By making the things dainty-looking as well as excellent the personal house market will give you a big profit, and honey is one of the things the producer can afford to take to the house of the consumer. Some people in the Province of Quebec have been sending me samples of mustard and clover honey which they are going to send to Paris. I pay them twenty cents a pound for those samples. I took a sample to my wife, and I have consumed more honey on my table in the last month than in the previous twelve. I have guests there at my table and they go back and say, "We will get honey." Honey is a thing you cannot get in the best condition in the retail stores. There is an unexplored market to the people who will supply it to the houses in towns. That is true in regard to everything I have touched—true of dairy products and fruit, and it is true of honey so far as I have observed the market. Then there is a general market, which means that the one that supplies that market takes the general average price. If the bee-keepers would say to two of the leading shop keepers in every town of any size, "Why do you not handle honey? we will supply it to you," these people could push honey and the customers would take it. Commerce has got into this line in late years, that the article which gives to the shop keeper the least trouble, the largest profit and the easiest turn over is the one that sells, because he advised them to take that. I have gone about with old clothes into the shops of England many times when I looked into the markets there for Canadian products, and the shop-keeper would advise me to take something that was in a very easy package. If you could spend one half day in each town and just get the man to take these little packages you would make an unlimited market for the honey. I am not saying anything more than to just indicate these lines.

In regard to the export demand, there is no market in England for honey of a common quality at more than four cents a pound. There is plenty of honey offering in England, at about four to five cents a pound, common, cut still honey, and said to be pure honey. There is a very good demand in England for exquisite honey, of good body and of fine color, and the English people do not object to a little yellow tinge in the color, at about 15 cents a pound in the original packages, retail price. Again, you see there is a tremendous glut of the common stuff, but there is a scarcity of the very nice stuff done up in nice packages. Just an illustration—three days ago I had a letter from England. I had asked an agent there to buy three packages of the nicest apples he could get. He bought three packages of Fameuse apples sent from Montreal, and they cost him 21 shillings a package, plus 1s. 6d. for carriage—that was 22s. 6d. for Canadian apples with little more than a bushel in a package. They were sold by the Army and Navy stores, which are, perhaps, the biggest retail dealers in London. In the same letter he sent me a report

from Bristol, where he had been a week before, that he saw a large quantity of Fameuse apples in barrels, and that they were being offered at six shillings a barrel and could not be sold at that; whereas I had paid 22s. 6d. a box for apples, and there was not enough of that kind of apples to go around. It meant I had paid as much for the box as they could get for three barrels and a half of the same things, but not selected. We had some honey experimented in England two or three years ago which did not much more than pay commission charges, because they said it had a peppermint flavor, and if there is any kind of thing that an Englishman can hang an objection on he will find it; but if it is the best quality he will give you the best price all the time. I know of some honey sent last year to England that sold readily at fifteen cents a pound in pound jars. The two members of that firm were in Canada last fall, and they said, "We have a good demand for honey which is put up in nice packages and looks nice on the outside as well as on the inside. If you need a market in England you can get a good market for honey of excellent quality in nice small packages, preferable one and two pounds glass jars. It is hard to get a sale in England at anything like a good price that you merely just put on the market as a job lot. There must be regularity in the supply and regularity in the quality. An Englishman never wants anything more than what he is satisfied with. The success of nearly all large things that go to England—in bacon, cheese, butter and flour—is to get a first rate good thing, and then stay at that dead level, and they will have no fault to find. If you can do that in the English market with your honey you can get a good price.

The only thing you are interested in in sending honey to Paris is the impression that may be made on the British public through the exhibition. We expect through the exhibition to attract a great deal of notice through the English press, because they will have special correspondents writing up exhibits, and we expect to make that a feature of the exhibit from Canada, the recognition of that by the British. Apart from the business aspect altogether, a very fine display of good honey from Canada would give a new phase of commendation to the country's resources, and would give the country a good name, and it would attract population, capital and travel this way. I do not think we need dream of having such an exhibition in Paris as in London in 1886. There is not the space available as then, and the space will be comparatively small, and the response to applications for supplies of honey have been so generous and general that we have been lately refusing exhibits and cutting down the quantities by one-half, and sometimes one-quarter, because it is not possible to find room for all the honey that is being offered. We have been offered altogether something like three or four tons of honey of very good quality from New Brunswick, Nova Scotia, Quebec, Ontario, and I think two lots from the far west. We have some honey arranged for in comb. Most of the extracted honey is to go in large packages and be liquefied and properly put up in attractive glass vessels in Paris, so as to make a good exhibit there.

I came, after all, to learn from the Bee-keepers' Association in what ways our Department can serve you than to give instruction. If you can indicate any way in which our Department can be of any use in helping to exploit the home market, or in meeting the foreign market, I think we will be very happy to do anything we can to help you; and if there is anything we have not done in connection with the Paris exhibition which can still be done we will be very glad to hear suggestions from you in that respect. So far your President has not allowed me to forget the honey part of the exhibition, but everything he has written has been directly along the line, and on the point of giving suggestions. I think it will be a splendid display and of benefit to the honey industry in Canada.

Mr. Evans: I have been waiting for a year to ask Prof. Robertson a question. I would like to know did the Government last year ship forty thousand pounds of honey to England or was it handled by one man, and did it net twelve and one-half cents a pound clear of expenses?

Prof. Robertson: Last year the Government did not ship any honey at all. There was no honey sent by the Department. Last year—that is, 1898—when I was in England, I had some correspondence from Brantford telling me that a shipment of honey had been made to a firm in London, and they complained of the quality; and they asked me if I could not look into the subject when I was there. I did give enough time to earn that the complaint was that the honey had a very decided peppermint flavor and

odor. It was not saleable at a good price. Then I made enquiries as to whether they could not handle honey, and I got the names of two firms who seemed to be in the best position to handle honey. I gave the names to Mr. Hall and others, and some of these people sent honey themslves direct to those firms, and we never got an official report from the firms or from the senders; but I got some letters about the thing, not officially, and one of them told me that the pound jars were selling for fifteen cents a pound, and there was a good demand for honey in those jars. I will give the names of two or three firms in England to anyone who would like to know.

Mr. Evans : Did the Government ever ship any to the old country ?

Mr. Robertson : Not the Dominion Government. We did not ship any honey, but we took part of that shipment in England and gave it away. We paid for it, of course. I think I arranged to take about 200 pounds of that honey on Departmental account. I sent some, with our compliments, to editors of some of the newspapers, in order to get them to write it up. We did not handle any honey in a commercial way.

Mr. Dickenson : With regard to Prof. Robertson's remark in connection with the packages, from information I can get, it is not best to send it to England in glass. They asked me in what shipments I made to send it in 60 pound tins, as they melt it up and put it in the glass themselves. The reason they gave was simply it would not be convenient to have glass shipped such a long distance, and there would be a very great danger of breakage. I do not doubt but what the glass would be the best if we could get the glass there, and that it would bring fifteen cents a pound ; but I prefer the sixty pound tins, with no loss, to run the risk of the glass.

Mr. McEvoy : As to the Paris exhibit, will the honey sent from all the provinces of the Dominion be permitted to be changed for some of next year's crop ? This season has been very poor in some places, and the quality of the honey will not be as good as usual ; and I think we would like to replace the honey with some of next year's.

Prof. Robertson : It has been arranged that all products may be replaced through the course of the exhibition, and if any exhibitors will supply honey of next season's crop of superior quality the Department will arrange for transportation of that and for the replacing of the others in Paris. (Applause.)

Mr. Hall : That is quite necessary in the case of comb honey. Comb honey, by going over on the vessels, may be injured. Comb honey has a great affinity for water, and it will absorb it ; technically speaking, it sweats and bursts the capping, and runs, and does not look well. Comb honey, to keep, must be kept in a very dry and warm place. I think we can supply a better quality next year.

Prof. Robertson : The reports I had from England were against sending comb honey for commercial purposes, because it was too risky, and too many of the sections were broken, but they did not complain of any of the honey in glass arriving in a damaged or broken condition ; but if anyone could have an agent in England who would refill the glass bottles from bulk there, that is the safest and cheapest way. One firm in London say they will do the refilling there and charge only for the bottles and labor. That is George Nicholson & Son.

Mr. Craig : I know a little of this manner of packing and shipping in glass, and certainly that is a feature that is perhaps against us in sending honey in that form to the old country. The glass is expensive and the manner of packing costs a great deal, and it takes away a great amount of the profit we would otherwise derive from it.

Mr. Dickinson : Is it desirable to send this kind of honey that the Englishmen complained of being flavored with peppermint ? I have got some correspondence in connection with that matter now in my possession, and I cannot think it is anything else than our honey from basswood. We call that first-class honey in Canada.

Prof. Robertson : I have been advised even to send buckwheat honey to Paris. I refused to send large quantities, but I have sent some. Some have advised sending buckwheat honey to bring out the qualities of the honey by contrast.

Mr. Dickson : How is it in small tins, such as two and a half or one's and two's ?

Prof. Robertson : I am afraid I could not tell you, but I will tell you what I will do. If you will write me at Ottawa I will give you the names of three of the best firms in England with whom correspondence may be opened before the season opens. One firm in Liverpool are interested in Canadian products. They have forty travellers, and they are willing to push Canadian goods. They have recommended one or two pound

glasses. I will submit to them the question of tins and obtain information from them and forward it to any medium which will reach you all.

Mr. Couse: In what way will samples be judged that are being sent over to Paris?

Prof. Robertson: I am not able to say what the action of the Department will be: Those of us who are Commissioners have advised the Commission as a whole to appoint experts for certain classes of works, and I have advised the appointment of a special honey expert, both to have it examined in Canada and have it put up in Paris, and be mainly under his care. Then, the name of every exhibitor of honey is going on the official list, and whatever award the Government may get for this joint exhibit will be made for the joint exhibit with the name of those whose honey composed the exhibit, and then a copy of that will be sent to every exhibitor.

Mr. McKnight: Respecting the question as to the popularity of the smaller tin vessels for the sale of honey in England, I do not know what revolution has taken place in the tastes of the people over there in 13 years, but I know at that period such vessels were not profitable to the bee-keeper to put in for the simple reason that the same quantity of honey put in glass vessels would bring a greater price than the difference between the cost of the tin and the cost of the glass. The customer there generally buys in small quantities, and wants to see what he buys, and it is not convenient to show honey done up in tins. I may say for years I put all my honey in glass vessels until honey got so cheap it was not profitable to do it. I imported from London pound glass bottles, such as are generally used in England for putting up honey. They cost me £1 a gross in London in five gross original crates. If honey is put up in glass here you would have to import the glass, pay freight and duty, and then freight again to England. If an arrangement could be made, as suggested, so that some responsible and reliable firm over there could be got to do that work and provide the necessary glass vessels it would save that extra expense, and I have not the slightest doubt but this arrangement could be made. Prof. Robertson has brought out the point that we must do something that will cause honey to be regarded as a staple article for all time—the uniform supply for the uniform demand. The nature of the bee-keeping business is such that the producer cannot meet this condition. There is only a limited portion of the year he can produce it at all, and those who are not acquainted with honey-producing give no thought to this fact at all. While we may be able at a certain time of the year to supply the necessary demand, the lull comes, and the market has to be worked up each year, That will be the case until someone takes hold of the honey and supplies the market regularly and continuously.

A vote of thanks was tendered to Prof. Robertson for his suggestive and profitable address.

MANAGEMENT IN EXTRACTING SEASON.

M. B. Holmes, Athens.

The mangement of an apiary during the extracting season is perhaps the most interesting feature in connection with the care of bees during the whole round year—interesting in the various ways and from the different standpoints.

The amateur is enthused at what seems to be the discovery of a connecting link between nature and art. The strict regard shown by the bees for perpendiculars, horizontals and regular angles in the construction of the honeycomb, as well as accuracy in spacing, and all without the aid of a square, plumb-rule, or trowel, arouses within the breast of the apprentice who has "entered upon" this ground with indifference, the desire for light and advancement until he shall become "a master" of the work. The novice receives fresh stimulus as he sees for the first time the perfect order and discipline under which all operations in the line are conducted, and the neatness, cleanliness, economy and industry so studiously observed by the little workers themselves.

The master in apiculture at the opening of the season under consideration notes with great satisfaction that each colony of bees has its thousands and tens of thousands already mobilized and fully equipped for service under their queen, ready to move when the order "forward" is given, and possess themselves of the rich treasures in the adjoining territory, and that without any blare of trumpets or display of bunting.

At the opening of the clover season, the appearance of bits of newly-made comb in the upper portions of the hive tells us that more room is required; the new comb referred to is easily recognized by its pure whiteness and freshness of appearance. We now proceed with the least possible delay to furnish all colonies which thus indicate that they are overcrowded with supers of drawn comb. This is of no inconsiderable importance, as a delay may mean the issuing of a swarm from the colony so neglected. Having placed supers on all crowded colonies, we now give attention to the less congested colonies, until all are supplied with good combs in which to store the rich and delicious nectar just now being distilled in nature's gorgeous laboratory, the clover blossoms.

In our work we find that the use of perforated metal queen excluders is necessary in the case of new swarms, that is, colonies that have occupied the hive but a short time; older colonies will generally occupy the combs with honey before the queen finds her way into the super. We now await developments, and if the conditions are favorable the extractor will very shortly be called into use.

A passing notice of our "honey hall" may not be out of place just here: An ordinary clapboarded building, 12 feet wide by 30 feet long, sealed inside with narrow ash boards, dressed and nicely matched, well lighted and well ventilated and furnished with as good an outfit for our work as can be purchased on the market. This gives you a sweeping glance at our extracting and store-room, and I would only add by way of suggestion that every extracting room, or place where honey is handled, should be kept scrupulously clean and have a cool and airy place where callers or prospective customers may sit and read the *Bee Journal* or the daily papers while they sample your delicious honey, and every manager should always be presentable and courteous to a degree.

When the supers are filled and combs pretty well sealed, we proceed to extract the honey. The uncapping arrangements, reversible extractor, honey tanks, etc., are placed in position, comb box with full set of combs got in, smoker lighted, and we are ready for operations. Carefully removing the cover and quilt from the hive where we wish to commence, we blow a little smoke over the combs, just enough to frighten the bees and start them down toward the body of the hive. The full combs from the super are now removed, the bees brushed from them in front of the hive, and empty combs from the comb box inserted, and all done so quickly and quietly that no disturbance is created and work goes on in the colony as if nothing had happened. We now proceed to the honey hall, uncap and extract the case of honey, return to the yard, and treat the next colony in the same manner, and so on until all have been relieved of their honey. This operation is repeated as often throughout the season as occasion demands, the favorable climatic conditions prevailing in some seasons rendering it necessary to extract a number of times, while in seasons like the one just closed the work in that particular is remarkably light, and the crop of honey correspondingly so.

As the honey-flow from the buckwheat and golden rod bloom draws to a close we remove all supers and extract the honey, and at a later date the supers are placed outside for a day to allow the bees to remove the little remaining honey, which leaves the combs dry and in good condition to be stored away for next season's use.

Returning by way of review to the first days of extracting, I would say that the close of each day's work should find all honey drawn from extractor and put in the storage tanks, over the tops of which there should be stretched a couple of thicknesses of cheese bandage to catch any small chippings of comb which may chance to be in the honey. Each succeeding morning should find the cappings made on the previous day (and not already rendered) snugly tucked away in the solar wax extractor, so as to get the full benefit of the sun's rays.

The honey knife should always carry a "razor-edge," as anything short of this does very unsatisfactory work. The knowledge of the honey-extractor's use can be gained only by experience, and the only suggestion I would offer to the beginner is, "start slowly and study well as you advance."

Mr. Armstrong: Mr. Holmes says he furnished all colonies which indicate they are overcrowded with supers of drawn comb. I would say use drawn combs if you have them, but if you have not, then full sheets of foundation. In another place he says the use of queen excluders is necessary with colonies that have occupied the hive but a short time. I want the excluder on at the same time as the surplus arrangements go on

Then he goes on to say that the extractor "will shortly be brought into use." I would not bring the extractor into use until the end of the white honey harvest, or eight or ten days after. As to the honey hall I think he has erred a little on the size, but on the right side. A building, half the size will do for 150 colonies. He also says to get a good outfit. I would agree with him there: get the very best in the market. Do not buy cheap clap-traps, because you get them for little money. He says to carefully remove the cover and blow in a little smoke. I say, give it to them full blast. He did not tell us how he got his honey from the yard to the honey house. He says then to place the supers out in the yard for a day. I would say, do not leave them out over night for the moths to deposit their eggs in. With reference to that I was going to ask Mr. Hall if he ever had any difficulty in leaving them exposed to moth over night?

Mr. Hall: They are never put in. They are on the hive three months, and off the hive, exposed to the flies, the spiders,—not to the mice—and covered from rain and snow for nine months of the year.

Mr. Post: Mr. Holmes has been accused of making a slight mistake in extracting his honey. If I understand the paper rightly he extracts his honey when the bees are all on it, just the time it is finished and capped.

Mr. Holmes: Yes.

Mr. Post: Then, I infer, Mr. Armstrong, you raise your supers and keep raising them until honey season is over?

Mr. Armstrong: Yes.

Mr. Post: Ten days after the honey season ceases the bees will shrink back from the top supers, and as honey has an affinity to absorb water, and if the weather turns a little cool, the top supers will not have nearly as good honey as if extracted when it was covered with bees and warm. I claim Mr. Holmes' system will give the best honey. Extract it, place it in a barrel or some tight receptacle.

Mr. Armstrong: Perhaps it is the locality. My honey season closed about the 12th or 15th of July, and it is left until the 20th. I may say my honey gives 12 lbs. wine measure, and I have had no difficulty in getting that weight.

Mr. Newton: I think our friend, after the information we have had to-day, will never be able to send his honey across the ocean unless he changes his method of working, because he says he never takes any honey off till the white honey is in, and, of course, he has his basswood and clover honey together, and they do not want that kind of honey on the other side of the ocean. I have not any reception room in my honey house.

Mr. Armstrong: I do not get my honey mixed up; I get my clover separate. If I find I am going to have a flow of bass-wood my white flow of honey comes off.

Mr. McEvoy: Mr. Holmes lives in one part away down in the north-east of Ontario, and Mr. Armstrong lives away in the south, and it is a great deal warmer there, and the time he takes it there is all right, and the time he leaves it on would not do in the other place.

Mr. Dickinson: I agree with Mr. Holmes with regard to taking off the extracted honey at the time it has ripened. There is a great deal to be gained by taking it off then, and nothing to be gained by leaving it on. You can get bees to accept combs that are slightly extracted much quicker if you take off the honey that is nicely capped, and give those combs back and they will go right to work lively. Another feature is to be sure there is not a particle of bass-wood honey with your clover honey. Therefore, it would be very necessary for me to have all the clover honey off I was going to take, not to say that I would take off all the clover honey that is there, but all the clover honey that is capped would certainly come off as soon as it was capped if I could find it out.

Mr. Holmes: That is the plan I follow, and I follow it just as closely as possible, removing the clover honey closely as possible before the basswood honey comes in. In Mr. Armstrong's criticism I think he did not catch my meaning in my reference to the queen excluders. I intended to say that young swarms—those that had been occupying the hive only for a few days—got the excluder; and, of course, they get it immediately before the super goes on.

Mr. Evans: I understood from Mr. Holmes that they take the supers of one hive and extract them and put them back before they touch another hive. It seems to me

that would be very slow work. I take eight or ten of them into the honey house, and if there are any robber bees they get quited down before I come back. I suppose Mr. Holmes' object is that each hive should have its own frames back again to prevent the spread of disease; but it seems to me that is a tedious way of doing business. As to the size of the honey house, I think Mr. Holmes' is not too large. I have a two-story house, 20x30, and I find it none to big; and I find that one of the things you should have is plenty of room in the honey house.

Mr. DICKSON: Does Mr. Holmes put on a queen excluder down on the old colony?

Mr. HOLMES: No; I do not find them necessary.

Mr. DICKSON: In my case we do. As regards the honey room I have no doubt it might suit some to have a large one. Mine is not. Possibly mine would be a little too elaborate for its size to some. Mine cost considerable, but there was money in it. As regards putting my honey when into extracted into a barrel I cannot agree with that. My honey room is 15 x 18 feet and it will hold four tanks and everything comfortable and nice. You cannot stay in there on a hot day, because the temperature will run up to 125°; and in connection with this same room I have a steam apparatus for any liquifying we may have to do. The tanks are covered with cheese cloth or cheese binder, two ply, and right above there is another screen to keep the under screen clean. But flies occasionally will get in and fly around, and you know what the flies will do. It is not long until you get your covers soiled. Also in this same room I have above that again what you would call a shelf to store away the honey when it is packed. This room is very elaborate, but I consider it a room that pays me, and I can produce a first-class quality of honey. It is a room that a good many have tried to see, and have failed, for the simple reason that I have a notice on that door, "No admittance here." I had bee-keepers very anxious to come about ten years ago, and who tried a good many ways to see it. I think, however, in our day human nature is inclined to yield a little more, and so the last ten years I have been more inclined to let bee-keepers see what I have there if they come in a proper way to see it. As for a large honey room I will not agree to that, because you must have heat; nature's heat is what will cure honey in first-class shape. In regard to taking in the comb one box at a time I think that would be very tiresome when extracting 1,700 pound in a day. We have gone as high as that; but we just begin and take of as many as 20 and 25 and 30. Of course we have a big supply of combs to do it, otherwise we could not do it.

Mr. CHRYSLER: It might be profitable to some to know how Messrs. Holmes Brothers obtain their extracting combs to get them drawn out; how they get that quantity, and how they get them in the first place; and also how the uncapping is done, and what kind of arrangement they have for catching the cappings.

Mr. HOLMES: That is a point that was passed very lightly over in the paper—how the combs are obtained. They are obtained by the use of full sheets of foundation in the supers in the first place; and I might add, in case of being short of combs we insert odd frames filled with foundation here and there throughout the supers. We get them drawn out in that way.

Mr. CHRYSLER: Supposing you get about 50 to 100 the first year, and the second you wanted to take 400, would you advise putting in two or three of the drawn combs, and the balance foundation or starters? Would not starters answer after you got one to start?

Mr. HOLMES: It may be that starters would answer as well. I have used the full sheets, and, therefore, I am not able to speak as to starters. With reference to the manner of uncapping I do not know whether I can describe the uncapping arrangement. However, it is a frame work that holds the comb, and the cappings drop into a square tin arrangement, that is a little lower on one side; that gives the liquid honey in the capping a chance to drain out.

Mr. CHRYSLER: Some time ago there was a great deal of discussion upon bees wasting the wax, and if they have extracting combs all the time without having to build any they will waste that wax, and I have considered it advisable, where chances are good, always to keep fresh frames with starters, probably one or two.

Mr. HOLMES: I might say in that connection I wish to give my bees the very best possible chance to take every advantage while the light honey is being stored; when the fall flow comes on golden rod and buckwheat I then give them more of a chance to work. I get a good many of my combs drawn out on the fall flow.

QUESTION BOX.

Q. Does the mating of the queen affect her drone progeny ?

Mr. HALL : I suppose by that is meant is there any possibility of the young drone having any of the characteristics of the queen ?

Mr, POST : We are told it does not, and I don't believe there is a man in the room that actually does know.

Mr. HALL : I do not know. My conviction is that they take after their grandfather. The only way I have of judging of that is from the marking of the progeny of that queen. If the grandfather has any Carniolan blood in it the queen will produce some pretty Carniolans, if she is an Italian queen she will produce some like herself, and all grades between mullatoes, darkies and whites.

Mr. HEISE : Carniolan bees—is that the worker or the drone ?

Mr. HALL : I mean both ; but the drones do not take after their father in their characteristics or in their color ; that is my observation. My observation may not be true. It should be answered by other people, because one man's opinion is not sufficient. For example, in one case in Detroit I was very anxious to know if the bees would winter in a cellar, and I asked the question, " Does the furnace affect bees in the cellar in an adjoining room ? " The answer was simply, " Yes, and not beneficially." My experience since then is that it effects them beneficially. If a man gives his opinion without any other discussion, you may get the wrong opinion.

Mr. STEWART : You have partitioned off your cellar with a furnace in it. I have a cellar I cannot use for bees on account of it being too warm ; the thought came to me, if I put a brick wall through the centre could I use it for bees ?

Mr. HALL : It would affect them beneficially ; that is the way mine has done.

Mr. WALTON : Surely we as bee-keepers are endeavoring to promote apiculture, and I think nearly all the interest centres around the queen, and is it not necessary that we know something about the mating of that queen, considering her progeny ?

Mr. HALL : I have given you all I know about it.

Mr. HEISE : According to what we have accepted as an established fact that the drone egg never comes in contact with the male influence, consequently how can it be that the drone progeny can possibly be effected by the mating of the queen ? If that is not true it alters the circumstances. Some are now questioning whether that is a fact or not.

Mr. HALL : Are you not one of that class who doubt it ?

Mr. HEISE : Not in the least.

Mr. HALL : I doubt it, and I have doubted it all along. It was said that the drone egg was unfertilized, and the mating of the queen does not apparently affect that, because we take it for granted the father of the drone is the grandfather.

Mr. WALTON : I would like to know whether bee-keepers would like to breed from unfertilized drones ? For my part, I certainly would not. It seems to me it is something we ought to understand if we are raising queens for our own use. How do the other breeders look at the matter ?

Mr. HALL : They look at it that the drone has no effect on the drone progeny of the queen, but we must look a little farther on for the next crop of queens we get ; they affect the second crop of queens. If the drone bee is the grandfather as well as the father of the drone, is he not the grandfather of the female or of the worker bee ? He is the father only of that. Then, when we go to raise queens or bees from the father in that progeny, we shall get the blood. I have a record slate on every hive. I have the age of the queen when she was clipped, and when I saw her last. I use the letters A., B., C. C. is killed at once, B. is killed when I can do so profitably, A. we do not breed from. With A. 1 we do sometimes ; A. 1 X. we breed from ; A. 1 X. X. we mark to raise queens from the next year. I could not raise them to sell that way unless I got two or three dollars each for them.

Mr. WALTON : I have been selling at a dollar each, but there is not anything in it.

Mr. HALL : Not if you raise them that way.

Mr. WALTON : If the second generation of queens is affected possibly the first is, but not so perceptibly.

Mr. HALL : Yes, we cannot notice it.

Mr. WALTON : It must be there.

Mr. HALL : Yes.

Mr. WALTON : I think it would be well for all bee-keepers to have their queens mate with good first-class drones.

Mr. HALL : That is another question. I cannot tell you how to do it.

Q. What is the best method of handling swarms so as not to increase the number of colonies ?

Mr. HALL : In 1883 we took 25,000 lbs. of honey on that principle ; we had more swarms that season than ever we had. In one apiary we had 80 colonies, and we increased to 84 ; in another 120 colonies and increased to 128 colonies. We had an abundance of swarms ; the first part of the season we hived every swarm on 4 combs and 4 foundations (4 sheets to the pound), placing the stock alongside of the swarms. Six or seven days after we shook all the young bees that had hatched in that time into or in front of the swarm, making it very strong, and took this brood away and hived a swarm of bees on it. There were no eggs and little or no uncapped larva. In that case every swarm of bees we put into those combs stayed and went right to work ; we carried that out through the season. We started with 200 stocks of bees and we finished with 212, and we took 25,000 pounds of honey. 10,000 pounds was comb honey.

Mr. WALTON : You did very well.

Mr. HALL : It was that method, and it meant a lot of work ; but we sacrificed our young queens.

Mr. HEISE : I think I remember of hearing someone relate how he handled swarms so as not to increase the number. When the season closed he hived swarms that issued in the hive that had previously cast a swarm throughout the season.

Mr. HALL : We have practised that to our detriment.

Q. What is the easiest method of managing out-yards in regard to controlling swarming ?

Mr. HALL : You will have to get a better man to answer that than me. I have had out-yards for years ; I am not satisfied with any method I have tried.

Mr. MCEVOY : Give us your best method.

Mr. HALL : Is it extracted or comb honey ?

Mr. HEISE : Extracted.

Mr. HALL : The best way I have found, when taking extracted honey, is to visit out apiaries once a week and look through the brood nest, and if queen cells are started take away all brood, (making a new colony of the brood), giving room in the supers and they are about safe for another week, but I find it a big job lifting the heavy supers and would like to learn of a better and easier way to accomplish the end sought.

Mr. SIBBALD : I have had some experience, but my experience is, perhaps, exceptional. My bees were all at home for the winter, and in the spring in moving them I moved them just before the season, and I picked out an average lot to take to the out-yard and put on the supers the day after they were taken there. They went into the supers immediately, and the queens were clipped. Friends were there that if one would swarm they would mark the hive, so that when I came out they would say such and such a hive came out yesterday and went back again, and, of course, I would make an examination of that one, and cut out the cells or take away a frame or two, whatever I saw fit, and in that way I managed first-rate, and I was not in the yard very much.

Mr. HALL : But you had a watcher. I had no watcher.

Mr. WALTON : Is it advantageous or desirable to put a queen excluder over the entrance ?

Mr. HALL : I have not tried it, and I don't like anything over the entrance of a heavy stock of bees. It makes them warm, and keeps the drones in.

Mr. MILLER : I do not know that I have anything to add to this ; it is something I would like to know. But last year I practised a system that worked very well for a time, and I was prepared to follow it, but found later on it would not work ; I should like some information. I made an increase from two colonies by shaking the first colony out and placing that brood on the stand of another colony that was about to swarm, and in removing the second colony from the location.

Mr. HALL : How long did that stay without getting the swarming fever again ?

Mr. MILLER : Last season they did not trouble me much.

Mr. HALL : My experience is they just last eight days and they swarm again.

Mr. POST : Necessity is the mother of inventions. I used to screen my bees top and bottom as I handled them in carload lots, and I experimented on leaving the bottom board off entirely from, say, June to September, and I have never been troubled with swarms. From 300 colonies I may get four and five, sometimes ten swarms through a season ; but a plan that I would say would be almost sure to keep them from swarming would be as follows : When you put the super on the hive in the spring I would leave the bottom, of course, screened, although there is no bottom board on it ; put the first top story on without a queen excluder, and as they store some honey and put in a little brood I would raise it and put an empty one under, and then put a queen excluder between the brood chamber and first top storey.

Mr. McEVOY : I do not think you will be understood. You say about screening the bottom—how high up ?

Mr. POST : A wire cloth is close on an inch square frame attached by Vandusen clamps to the bottom.

Mr. DARLING : That simply takes the place of the surface of the board work ?

Mr. POST : Yes ?

Mr. HALL : That is just what I have done the last two years ; it is location. Mr. Gemmell and myself expected to have the results Mr. Post got by acting that way. It has retarded swarming and kept the bees at work, but it has not prevented swarming.

Mr. POST : This last season was a very good season for swarming. I put out 110 colonies out at Springbrook. There was a man a quarter of a mile from my place who began the season with nine colonies and his increased up to about thirty-three or thirty-four ; I did not have one that offered to swarm.

Mr. WALTON : What was the percentage of honey coming in every ten days ?

Mr. POST : I did not have scales with me ; I have scales at a place four miles over, and there it would be from eight to eleven pounds a day—not every day. There is something very strange about that. Some days we would get eight and ten pounds, and some days we would get two pounds, and to all appearance both days the same kind ; there is something about the climatic conditions of the atmosphere that we do not know exactly about. Some days the blossoms will secrete honey more abundantly than others.

Mr. SAUNDERS : I have no regular rule in out-yards.

Mr. McEVOY : How have you checked them ?

Mr. SAUNDERS : As far as I have done it I let them swarm ; I try to be there every day, in the forenoon especially.

Mr. HALL ; If you had three apiaries you could not be there as regularly.

A PLEASING EVENT.

The new president, Mr. C. W. Post, took the chair after the retiring president, Mr. Brown, had returned thanks to the Association for the cordial support given him while in office.

Mr. McKNIGHT : This Association has been a success right from the first till now, and that is something creditable to it. There have been men that have done more than Mr. J. B. Hall has done for the Association in purely business work, but I want to tell you that there is not a man belonging to this Association now or who ever did belong to it that had made this Association's meetings so interesting and practical as our friend Hall. (Applause). He has been the life and soul of our gatherings for the last nineteen years. I think it would be a graceful thing to do anything within our power to show our appreciation of the value of his services to this Association. Although he does not say very much outside of this Association he is known all over the continent of America. I would like to move that this Association make J. B. Hall a life member. (Loud Applause). It is our duty to show Mr. Hall some mark of appreciation of the valuable services he has rendered to the bee-keeping interests of this Province. I hope this will not be made a precedent. It would be very little honor if all the old men were to be associated with him. I would like to see Mr. J. B. Hall the one and only life member of this Association during my lifetime.

Mr. BROWN : I have very much pleasure in seconding Mr. McKnight's motion ; I can endorse every word he has said with reference to Mr. Hall.

The motion was carried by a rising vote, and the singing of "He's a Jolly Good Fellow," after which Mr. Hall briefly and suitably replied.

Q. Does the meeting think it advisable to encourage the public to keep bees?

Mr. HALL: Yes—No. I would like to encourage all those that have natural tact to keep bees, and are in a locality where it would pay them to keep them, but to indiscriminately advise every one to keep bees for a living will do a great injury to them. We should be very cautious how we encourage people to keep bees. I may be a rather peculiar temperament; I think a bee-keeper, like a fiddler, is born. If a man can look after ten thousand little things and do everything right, and do them at the proper time and in the proper way, and is desirous of keeping bees, and is willing to live in a new country, encourage him.

Q. Is it advisable to give excluders between all supers when working for extracted honey?

Mr. HALL: One word will answer that: Yes. Why? First, by having the queen excluder below you can work as fast as you choose during the extracting season or manipulating your supers, no fear of killing queens, and it makes no difference if you kill a few hundred workers, because there a few thousand coming on every day to take their place. You save fifty per cent of the time during extracting knowing your queen is not there, and there is no danger of killing her. The nature of the queen is to keep to the top of the hive, and it is only the bees filling in to the top above her that drive her down. Finally she comes down to the bottom board; they cramp her so that she cannot lay enough eggs, and consequently they get the swarming fever; and therefore I find it advisable for extracted honey on all occasions to have a queen excluder.

Mr. NEWTON: I asked the question, and it was for friend Holmes' benefit, but he is not here. He said, in his paper, he only used them where he was hiving swarms.

Mr. HALL: Mr. Alpaugh worked for me three years. The second year he worked for me I wanted him to work on shares. One of the three seasons there came two or three cold days, and he picked out twenty hives of bees that had nicely capped honey on the tops; he went to work at one o'clock and quit at six; he had to carry some honey about fifty yards to get it to the extractor. His sister was visiting him at that time, and she had her knitting down with her brother, and she assisted him by shutting down the gate of the extractor when the pail was full. Make a guess how much honey he had. He did big work because the queen was shut off.

Mr. SHAVER: Eight hundred pounds.

Mr, HALL: He took over one thousand lbs. He could not have done it if his queen had been there. He got over fifty pounds per super from them. That is one advantage of having your queen down—you can work with confidence.

Q. Has any one had any experience with Carniolan bees? If so, how do they compare with other races of bees?

Mr. HALL: I am the first man that had a Carniolan bee in Canada. She was eighteen days in the mail bag, and when I received her there were three live bees with her. We looked at her and came to the conclusion that she was not worth much; we got her safely introduced; she lived about six weeks, but during this time we raised some queens from her. I have never had a better lot of bees than the daughters of those queens—never for quantity and quality of honey. Of course we kept them for a couple of years, and we thought we would like to have a change, and we received three importations after that, and they were not worth the powder to blow them away. But I like Carniolan bees mixed with Italians. My bees are that mixture. Of course you cannot control these young ladies. They go out visiting the men, and therefore if I have any other blood it is from accident, not from design.

Mr. CRAIG: What about their swarming propensities?

Mr. HALL: Just as good as others, and no worse.

Mr. SHAVER: Mr. Hall clips the queens; I know of two different apiaries where they have them and they complain terribly.

Mr. POST: My experience has been almost identical with Mr. Hall's, with the exception that I have never had any poor ones. They are the best race of bees I ever handled. This was one of the poorest years we ever had; we secured between three and four tons of buckwheat honey. The whole amount was secured by the Carniolan bees placed promiscuously in the yard along with Italian hybrids. Many of the Italians required

feeding and they were fed with combs taken from the Carniolans. They will beat any bee I ever had in wintering and building up in the spring, and they are no more likely to swarm than any other bee, in my experience, but you will make a mistake if you put them in a small hive, I believe. Give them plenty of room. I believe in a large hive. My hive is equal to about eleven Langstroth frames. Through the fore part of the season till about 15th June, I allow the queen one top storey and the bottom storey—that makes 16 plus 8, equals a capacity of over 19 Langstroth frames. As soon as the queen begins to lay a little above I raise the top storey and place another one under and place the queen excluder below.

Q. Bees intended to be wintered in the cellar this following winter, and are on their summer stands at present with a rim of three inches filled with sawdust on top—would it be better to put them into the cellar right away or leave them until they get another fly ?

Mr. HALL : My answer to that is to put them in to-morrow if it is not freezing, and if it is freezing let them be until they are thawed out, or just get some hot water from the teakettle and pour it around the stands, so that the moving may be done without cracking. Never mind a fly ; they have eaten nothing in the last few weeks to want to make them fly. If they are frozen down loosen them somehow without having any cracks. I like to put bees in when they are flying ; the clusters are all loose ; you will get a few stings, it is true, but very few. We do not break a cluster by putting them in ; the cluster is already broken. They form a cluster when they go into the cellar.

Mr. DICKSON : I believe in putting them in early. Mine have been in just about a month now, and, just as Mr. Hall says, there were lots to fly out, as they had not settled down to clustering.

Mr POST : If bees have a rim of sawdust, as represented in the question, even zero weather will not do them any harm. I have about 200 colonies myself now in the same condition ; I do not feel at all uneasy about them, although as soon as the weather changes a little warmer I will take them in. The way my stands are built they will never stick.

Mr. DARLING : My bees are not in the cellar yet, and are not packed with sawdust, but I can take them up after settling down by putting them on a pair of sloops or bobs, and I can draw them on a little snow or on the bare ground, and perhaps before I get them to the house they do not know they have been moved, and sometimes they are all quiet when we get them into the cellar, and sometimes they stir about. Mr. Hall advocates loose bottom boards. I raised up those that were loose, and took off a great many that were not loose, and I propped the front of the hive off the bottom board about an inch ; I am not bothered with moisture. My bees last year were not put in until somewhere about Christmas. The reason for being behind was on account of sickness. I found my bees last spring came out drier and better on the average than they did for some years.

Mr. SIBBALD : I have not very much experience in wintering outside. I have wintered some for two or three seasons ; and I packed them up a couple of weeks ago. I believe they would be better packed earlier, but I had not time to do it.

Mr. SAUNDERS : As far as wintering outside, my hives are packed all summer ; the only trouble I have in the fall is putting on the cushions, which I do about the last of September or first of October. I asked this question. In the home yard I am used to wintering in the cellar. After I had left for the west about 1st September they got some honey dew for about a week or so, and I have been too busy to put them in since I came home, and I wanted to know whether it would be advisable to give them a fly on account of the honey dew, or to put them in right away.

Mr. MCEVOY : That is a serious thing. If he puts them in the cellar he will have to bring them out pretty early. Leave them out a little longer, and bring them out earlier, too.

Mr. EVANS : I winter both in the cellar and out of the cellar. I packed outside a couple of weeks ago in sawdust and clamped eight or nine of them in a twelve foot clamp. The sawdust I usually take in in the spring and put in the honey-house, and it is never damp. I can winter in the cellar without any loss whatever, unless from starvation, but I do not think the bees come on as well when they are taken out. I do not usually put them in until the middle of January ; I think it is wise to have them out as

long as possible. I take them out as early as possible. My cellar is particularly dry; the room is just opposite the furnace, and I can open the door and heat it, or close the door and cool it off. Instead of propping up the hives I simply have the hives back so that they are a couple of inches behind the bottom board. I do not put any cushions on top—just leave the ordinary quilt without loosing it. I set them round in rows, and they seem to winter all right. The only objection I have to that system is they do not come along in the spring as well as those that winter out-doors. At the same time that is not a fair comparison, because I always put the light bees in the cellar.

Mr. HALL: What time do you set them out in the spring?

Mr. EVANS: Last spring I did not set them out until about 1st of April; the year before about the middle of March.

Mr. HALL: If you have time, put them out on the 1st March.

Mr. NEWTON: I am an out-door winterer, and I fixed mine up about one month ago. Bees that are wintered out-doors should be fixed up just as early as those that go into the cellar, and I think the sooner we get done with them and leave them to their own glory the better. If we keep disturbing them in the fall I think we will not have such good success in wintering. Then, too, I winter in separate cases. I used to winter four in a case, and I think it is a very good idea, and cheaper than the single. I do not like a clamp; but I like either singles or in fours.

Mr. ARMSTRONG: How much packing does Mr. Newton use?

Mr. NEWTON: Four inches on the side and about ten on top.

Mr. ARMSTRONG: Is it necessary for ten inches on top?

Mr. NEWTON: I will not say it is necessary to have ten on top, but I like it?

Mr. MCEVOY: What is that on top composed of:

Mr. NEWTON: Composed of forest leaves; I do not think there is anything to equal forest leaves unless it is cork saw-dust.

Mr. POST: Do you pack them solid?

Mr. NEWTON: I don't make any solid work of it; I just throw them in. I do not think the solid packing is as good as loose packing; the frost goes through solid packing sooner, My packing is composed of wheat straw; sometimes I use a little oat.

Mr. MCEVOY: Have you any other packing than forest leaves, Mr. Newton?

Mr. NEWTON: Yes; I have planer shavings, saw-dust, flax sheaves and cut straw, and I saw one place where they used rough papers torn up and thrown in.

Mr. MILLER: Some think there is nothing like the flax sheaf. We have a flax mill in our village, and if I could not get anything else I would use flax sheaf; but I would sooner go five miles for leaves than twenty-five yards for flax sheaves, because flax itself is of a very cold nature, and it holds the moisture. One thing I find necessary is the space on top of the frame to allow the passage of bees from one frame to another. Never allow your bees to be shut down on the bars of your frames; they cannot get a passage from one frame to another. You can cut holes in your frames, if you like.

A MEMBER: I pack mine all outside, but I never put them in a case. I pack every one of them singly, each by itself, and, as Mr. Newton does, I leave about four inches of space around the hive, and I fill that in with wheat chaff. I have tried clover chaff, but it seems to lay too heavy, and get mouldy.

Mr. MCEVOY: I agree with this gentleman. I like each to stand separate and single.

Mr. SAUNDERS: So far as the top packing is concerned I have had a little experience with different kinds; I have tried planer shavings and leaves, and have had the best results from saw-dust cushions. At first I made the cushions too large. I make my cushions now so that there is an inch space between the inside of the hive and the cushion.

PRODUCTION OF COMB HONEY.

By JOHN NEWTON, THAMESFORD, Ont.

My apiary is run for comb and extracted honey. I usually select the strongest and best colonies for running for comb. As regards the best, if the records of the hive should say that they built braces or burr combs I do not want that colony for comb, as I believe breeding has a great deal to do with that, and comb honey supers with braces across

them are not nice to handle. 'I would say pinch such a queen. When spring work has been done—clipping queens, giving room to the crowded queens, by scraping honey at the top of frames so that those cells will be replaced with eggs by the queen, levelling up hives, etc.,—and before the honey season opens I see that my comb supers are scraped and filled with sections $4\frac{1}{4}x4\frac{1}{4}x1\frac{5}{8}$, which are filled full of foundation, running about 12 square feet to the pound, made from the finest wax that can be procured. Separators are used between sections, and a perforated follower or divider at the sides, which gives an extra bee space, which is of great importance for keeping up the necessary heat day and night at the outside of the outside sections. The divider is just made as one of the separators with a cleat nailed on to allow the extra bee space, and filled with 5-16th inch holes. I use a two part super, thus giving the bees room to store their surplus, and at the same time not giving them so much room that they would loath entering them, as they are at times if super is given them to cover the whole of the top of the hive.

Now, having everything ready when the honey season opens, with hives selected which we desire to run for honey comb, and which should be crowded with bees from side to side, and which on drawing back the quilt we see to be filling up with new honey, we place on one of those half supers close down on the rim of the hive to keep it snug and warm. When swarming commences hive swarms on old stand in hives in which have been placed five starters about two inches deep, the rest of the hive being filled with dummies. After swarms have returned, place parent hive alongside of swarm for five days, after removing to new stand, the flying bees of which will go into the swarm and will thus strengthen it up and give us the best hives for comb-honey production. If the swarm is very large, where one or two should go together, supers are at once taken from parent hive and placed on swarm with a perforated metal board between, so that the queen will stay below and make her home there. An average awarm I leave a day or two before putting on supers, and this catches the pollen below and does away with it in sections. If I have placed on perforated metal boards, I remove them as soon as the queen has made her home below, as I find bees do not work so readily in sections if they have to pass through them. During the honey flow the hives need close attention to see if they require more room, or supers reversed from end to centre so as to get the end sections as well filled as the centre ones. We work the tiering-up system, always putting the empty super next to the hive. When supers are finished they are taken from the hive by means of the smoker or bee-escape, and carried to the store-room. When all honey is taken off, the sections are scraped and graded, then packed in no-drip cases holding one dozen sections ; then they are ready for the market.

Mr. W. A. Chrysler : No doubt Mr. Newton knows more about comb honey production than I do, but I will endeavor to insert a wedge. I would take your follower out, and in regard to your perforated followers to retain more heat, I think we understood yesterday that a follower has no heat-producing qualities.

Mr. Newton : I did not say to cause more heat; it would keep an evener temperature.

Mr. Chrysler : It has something to do with keeping it warm, no doubt, but probably many of us have not sought the real reason for that being done. The outside combs of a brood chamber, between the outside combs and the hive, contain the coldest air of the hive, and they get the draught from the entrance : and there is a current of air that passes up on the two outsides of the hive, and will pass to the sections if those two spaces are not closed ; and this perforated divider will, no doubt, if placed properly, conduct that cool air and draught up past, so that it will enable those combs to be built out better than they would be, and probably built out as well as if in the centre. But I think we can discard those perforated followers and close up those spaces on the two outside frames of the brood chamber, the top of them, and then the necessary air will have to pass through the cluster of the bees, more especially at night, as our comb building is carried on all night long, and in very cold weather the cluster of the bees will somewhat contract and cause those draughts to go up on the outsides of the hive, but I think Mr. Newton recommended dummies and five frames. I do not think it pays. I would rather put the whole of the combs in at one time, because they have plenty of space below, and they will build the brood combs down no faster than the queen wants them : and if you have the full sheets of foundation in the sections they will go up there at once, and they will not build down even so fact as when contracted, especially if you leave

them any time before you put on the super. They have an idea it is pretty warm down there, and they are so close together; and no doubt they will build it down quicker than if the whole were across. With reference to drone comb being built, they build the comb below for the queen as she needs it, and as they have plenty of room there they will not build drone comb, because drone comb is built when they have ideas of swarming, and it is no doubt built more at that time; and if they build ahead of the queen they will have an idea that they are going to be crowded soon, and will build more drone comb. As for supers being placed on the bees, I think there should be good care taken to have them down very tight, so as not to allow any light or air to pass through. Draughts, even though very slight, hinder the building of combs. Try to protect the bees when building comb as much as you can. If you take them out into the air and light they will stop. I would even rather have the supers overlap the body of the hive to thoroughly keep the draughts and light from them.

Mr. Darling: Mr. Chrysler said that drone comb is built when the bees are affected with the swarming fever. I had a little experience about ten years ago. I think it was seven colonies I thought I would take comb honey from. They were new swarms, and, as some of you know, I used altogether at that time the old Jones hive. I placed the swarm on five to seven frames on starters, put in the perforated metal, gave them the sections behind this perforated metal. Three out of seven, I think, would have been completely ruined for the next season if I had not overhauled them and taken the combs away, and given them some other. There was more drone comb built than worker comb. They were new swarms on starters and not too much room, and they had the sections to work in; they did not build the drone comb very fast. Of course, I know people say old queens will be the cause of more drone comb than young queens; in this case I cannot say as to the age of the queens.

Mr. Chrysler: What I meant about the drone comb in contracted hives is that I think you are liable to get as much, if not more.

Mr. Newton: I must say, with regard to Mr. Chrysler's remarks, that we do not get anywhere near as much drone comb when contracted as if we left an open space.

Mr. Shaver: Do you and Mr. Chrysler use the same sized hive? I have an idea that Mr. Newton's five frames are equal to Mr. Chrysler's hive.

Mr. Newton: I have worked with a dozen different hives, and my experience has been the same in every instance, that contracted hives do not produce as much drone comb.

Mr. Sibbald: Comb honey is a part of bee keeping that I am very fond of. I have given it quite a bit of thought and study, and I think from the paper that Mr. Newton has read he would be able to produce first-class comb honey. In some things I agree with him, in other things I have a different opinion. He said he used perforated divider on the outside. I would like to ask him why it should be perforated when he wants to retain heat? Why not use unperforated divider at the outside? Then, he uses a half super. Well, I can understand why he would use a half super when he contracts his bees in that way up to the centre of the hive, because they would not fill the outside sections so well. I rather think Mr. Chrysler's idea is right in the matter of full hive; and I would rather have starters, not two inches, but half an inch or quarter of an inch, just sufficient to let the bees start, and instead of clustering in the centre they will cluster across the top, and they will start every one of those little starters. You can spread them out by coaxing them on to these little starters, and when we have them spread all across there we put our super on; and the bees will take readily to the full sheets of foundation, because they have not much below, and they would rather take that than build new combs, and they will spread right up to the very corner of this super in an hour after, and they will go to work at once, for where their treasure is their heart will be, too. As to the drone comb, I think Mr. Chrysler is right about that in my experience, and I would just like to ask Mr. Newton if he has ever tried to hive in a large hive, and putting in all the frames with small starters.

Mr. Newton: Yes; before I made foundation for myself I did not want to spend any more money than I could help, and I used to use the narrow starters, and I never had as good results as with a two-inch starter. I would not advise any larger than two inches.

Mr. Sibbald: Why draw the line at two inches?

Mr. NEWTON : Why draw the line at one quarter? Because that suits you best, and two inches suits me best.

Mr. SIBBALD : And if you take it down two inches, why not take it three inches.

Mr. NEWTON : That is where you are going too far : then you are giving the queen too much space. The bees will start to build, and she is going to have a chance to let them build a lot of drone comb, but with two inches she fills that. I wish I had brought a few combs that have been built on the five-frame process, and I think I could take you to hives in my yard where, looking at five frames, I do not think you could find a patch of drone comb with young queens.

Mr. SIBBALD : In our yards we have old and young queens, and we cannot govern that, and we have to do the best we can with them.

Mr. NEWTON : I have tried what Mr Chrysler and you suggest with regard to using no dummies, and hiving them on the full size hive, and to me that has never given as good a results as contracting.

Mr. SIBBALD . I disagree with you on that point.

Mr. NEWTON : I discarded my full super and went to work with half supers, and I think it a great deal better than full supers which cover the top of the hive, and I have done away with all my full supers.

Mr. SIBBALD : I find with the work I have to do in the busy season that one super is small enough, and I believe I would rather have a bigger one still if I was going to change again. As to hiving on the old stand and placing the old hive alongside, as Mr. Newton said, I agree with there. He said he left a swarm two days before putting on the super. I think he is pretty nearly right there, although it might not be out of the way to put the super on next day.

Mr. NEWTON : I agree with Mr. Sibbald, because there is so much difference in some hives; some would make their home there in half an hour, and go right straight to work.

M. MCEVOY : Would there not be some danger of pollen if you did this right off. With the two days' system you would not run any risks.

Mr. SIBBALD : If they are hived at noon, and you look in at night, if there has only been a little foundation you will find perhaps three inches of comb, and the next day you will be surprised what a lot they have ; and the queen does not start to lay right away as rule, and there is room for the honey and for the pollen, and that is why I object to Mr. Newton's plan of two inches of foundation. They draw that out and they get a whole lot more on to that before he puts on his sections. They would have those five or six nearly drawn down to the bottom in two days without a super.

Mr. NEWTON : That has just put me in mind of one thing why I like that two-inch starter better than Mr. Sibbald's way : I can catch the pollen quicker below than he can catch it in his half inch starters, because there is no place whatever to store his after they start to build.

Mr SIBBALD : I can readily understand where they put their pollen, because if you look into a hive you will find the pollen on the comb near the outside, and you contract them so that they have not any outside comb ; but if you had ten you would find the pollen off to the outside. I have produced a good deal of comb honey on that plan, and very few sections have been spoiled with pollen—I do not think there have been two dozen in all I have. Mr. Newton takes off the supers with a bee-escape.

Mr. NEWTON : Sometimes; I do not think in the last two years I have used one bee-escape.

Mr SIBBALD : As to packing for market, I believe if every one would take the trouble to pack them up in an attractive shape there would be better prices got for comb honey, and the grocers would not swear so much when they handle them.

Mr. HOLMES : One more point : Mr. Newton tells us in reference to the queen excluder he places it between the hive and the super, and after the queen has got well established below he removes the excluder. We would like to know just what "well established" means as to time.

Mr NEWTON : I would say just about what I said as regards the putting on of the supers—it might be half a day, it might be two days ; and I do not think if it is taken off the second day they would ever attempt to enter the section.

Mr. McEvoy : As a fixed rule ?

Mr. Newton : We have no fixed rule.

Mr. Hall : When she commences to lay.

Mr. Newton : I was sorry our friend Holmes was not in last night when I brought up the question. I would like to have asked him why he does not use perforated metal in the extracting season between all supers ?

Mr. Holmes : Answering that question just on the moment I would say for this reason : My experience has proven to me that the percentage of trouble in that regard without the use of the queen excluder is very small indeed ; and, further, I take it that the bees work up and down freer without it, and so long as the queen does not bother us to any great extent we forego the use of them except on the young swarms, and I put in the queen excluder there, and leave it there perhaps a little longer than Mr. Newton does in the production of comb honey.

Mr. Hall : I use queen excluders. The first lot of queen excluders I bought was for eighty stocks of bees. I was so tickled with them that a week after we bought queen excluders for every hive we have, and, let me tell you, I do not want any queen excluder except during the time of swarming, and I do not want it then excepting three days, unless I am too busy to take it off ; and we never want any hive for extracted honey of two or three or four storeys high without the excluder to keep the queen below, because in my case more than fifty per cent. go up. My hive is equal to 11 Langstroth frames, 18 inches long and 10 inches deep, and it is not enough for all queens, even without the honey, and, therefore, I do not want to run any risk. I put the queen excluder on. Then, when you are extracting you have no danger of killing queens, and you can work as quick as you like, and if you do kill a few hundred worker bees you do not do any harm. I always use the queen excluder in the extracting hives between the brood chamber and the supers.

Mr. Holmes : I said that the percentage of trouble in that regard was very, very small. I think I would be safe in saying not five per cent.

Mr. Hall : Your location must differ from mine, but with fully fifty per cent. of the queens go up.

Mr. Newton : Mr. Chrysler criticised this paper with respect to the perforated followers being set up on the side of the super ; he complains of the draught. The only reason of that is to prevent the draught. It need not to be perforated for that. I use perforated and plain, and I find the plain, if set up on the side, is equally as good as the perforated ; but my experience is that if you have a colony that fills up your hive from corner to corner, the bees are going to fill your sections from corner to corner ; and if there is an extra space outside your divider, that is filled with bees as well as next to the combs, so that it can be kept just as warm on the outside of the super as in the centre.

Mr. Chrysler : Why not prevent it before it goes there ?

Mr. Hall : We do prevent it.

Mr. Sibbald : I think the plain would be just as good.

Mr. Hall : My experience is it is just as good as good as the other, but the space behind it is what you want. The chief object of the half super is to coax the bees up. Then they will work on to 12 more than 28, and when we put on the second super we have to have half-honey boards ; then, when they have got nicely to work in one piece we lift this up, and shove this over, and the honey is around where there is no brood, and they will immediately attempt to fill up that cavity in the centre ; then we have then full at the corners any way. We do not want a half super after that, but for convenience sake we use them up to 5, 6, 7, 10, 12, 14, as the case may be.

Mr. Darling : What are your half supers made of ?

Mr. Hall : $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{1}{16}$th or 1 inch—it makes no difference. My hive is made of inch stuff. I have to use $4\frac{1}{4}$ sections because that is the standard size, and unless I used that size I could not get more sections if we ran short. If we ran short we should lose, perhaps, a large percentarge of our profit, and I had to discard the oblong sections which I used to use.

Mr. Darling : Do you put your sections lengthwise or crosswise ?

Mr. Hall : Lengthwise ; I prefer to have the back end of my hive to run out rain water.

Mr. SIBBALD : After you put on the first case you say it does not matter about the half case any more ?

Mr. HALL : It is more convenient and quicker to use full, but towards the end of the season these half ones go on again. With the half super, if you think there is going to be any more come in, put on 12 instead of 28, and those 12 are more liable to be filled than the 28 ; but through the main honey harvest they take a little more handling, but we get so much more finished honey that it pays for this extra handling.

Mr. DARLING : When you put one super, do I understand they begin at this end of it ?

Mr. HALL : Yes, sir.

Mr. DARLING : Why not take this super, if you want it filled up, and shove it that way ?

Mr. HALL : Then I would have to have two honey boards.

Mr. SIBBALD : You say they start over the brood nest to build the sections. That is one of the weak points of Mr. Newton's system ; he contracts to the centre, and there must be sections out over the outside of the brood nest.

Mr. HALL : Yes, and he uses dummies, and they can work into those sections.

Mr. SIBBALD : They will not take to them as quickly.

Mr. HALL : Certainly not. I will give you my experience hiving with full hives. We use five starters. I generally put on half-inch or three-quarter inch, because it is easier for me to handle. We have the five starters for the purpose of getting all worker comb built by our bees. In an out-apiary this year we simply shook them off into full hives. I have been through them since, and I am sorry to say there is forty per cent. of drone comb—drone at one end and worker at the other. With my bees it requires five to hold them, and they will swarm out in about ten days after they have been hived. One reason why I put them on five frames is to get all worker comb. Another reason is it drives the bees up into the supers.

Mr. SHAVER : What age queens do you use ?

Mr. HALL : I like queens of the previous season, but I do not always get them so. Then, as to bee escapes, I have three dozen and three of them, and I have not enough.

Mr. McEVOY : I have not enough, and I have that many.

Mr. HALL : I use none for extracted honey. I want bee escapes for comb honey ; except you are pretty quick about it you have a regular shaking.

Mr SHAVER : What kind of an escape do you use ?

Mr. HALL : The Porter proper.

Mr. BROWN : How many do you find the best number ?

Mr. HALL : One is better than fifty or than three. I put them on in the afternoon, and I go round in the morning and take off my supers and take them to the house. I have a honey house, one for extracting, for the carpenter work, and one for the honey work. I keep my honey in the house, and it is over the furnace room. I have a register, but I never have the job of using the register.

Mr. SIBBALD : Do you ever find at the latter part of the season they will chew the sections ?

Mr. HALL : They will do that if you smoke them. With my east apiary I have a young lady, and when I went there she had sixty pound tins and 18 supers of honey, but she had smoked them pretty well to get on the escape boards, and some of them had bitten the sections. We use bee-escapes not for extracted honey but for comb honey.

Mr. MILLAR : Mr. Newton in his paper said he left the swarm five days. The colony in that case with my management would swarm in a large percentage of cases, and as regards the escapes, I use them ; I would not think of doing without them. The perforated divisions I have not used sufficiently to say anything about. With regard to half supers, Mr. Hall gave us very good reasons for their use. My hives being odd I use ten frames, equal to five Langstroth frames, but I have my brood under the whole super, and I have no use for these half supers. I use the Headdon. I have brood under my whole super surface.

Mr. NEWTON : I thought I was using a very low estimate in mentioning five days, because I did not expect we would have any swarms at that time.

Mr. HALL : I have fifty hives, the same as this gentleman uses, and I have 150 supers on them, and I have the same objections to those supers. I use them because I

have that hive, and those supers fit it. Then, I very often give a half super to a swarm of bees because I do not like to give them another full super of 28 sections. It is the first part of the season and the end of the season where the small supers have the superiority. I have 150 of those very supers, and they are good. I do not use them as the maker intended them to be used. I never take out one uncapped frame and put it in to the centre so that it will be finished, and I never turn it over because my bees fill to bottom better than the top. I never move broad frame which holds four sections, because I have not the time. I fill the thing full of foundation. I guess that was calculated to be used with little bits, and that reversing is intended for that.

Mr. Heise: I conducted an experiment some two years ago. I had a board something after that style (shows), and there was an escape at each of those points, 8 or 9 all facing the one way. I had then a Porter back of that three inches, and then a double lightning escape, making in all 13 escapes. I piled up about five supers, and put the escape board on top. The bees started to rush out of the super at the side, and 90 per cent. came out of that one space.

Mr. Hall: They come out where the sun is.

Mr. Craig: There has been a great deal said about escapes. I do not want to say anything one way or the other, only in our own experience while we have an abundance of escapes we have used carbolic cloth instead of smoke: a small quantity of carbolic acid added to a quantity of water, and put on cotton cloth. There is no danger of any taint. We spread that carbolized cloth over the super when it is on the hive, before we take it off?

Mr. Brown: How long should it be on before it is time to take it off?

Mr. Craig: Just a few seconds.

Mr. Hall: I put these things on in the afternoon, and I do not like to work in the sun, and so in the morning I get around with the wheel-barrow and wheel load after load into my room and I take off my escapes at my convenience. They may be on a day or two before they come off.

Mr. Armstrong: I wish those who do not use queen excluders would say how they rid their supers of bees without the bee-escapes.

Mr. Newton: I give them a good blast of smoke, and grab up the sections and give them a right good shaking, and soon get rid of the bees; and I never notice any cappings bit in any way. A great many people use different things in their smoker. I think there is nothing to equal planer shavings when we want a right down good smoke for a short while.

Mr. Chrysler: There would be a little danger with some bee-keepers in using too much smoke, without a warning, and have the honey tainted. With proper judgment there would not be much danger in that line, unless it might be smoke from certain kinds of fuel.

Mr. Newton: Every bee-keeper will have to use his own judgment.

Mr. Shaver: As soon as the bees go down stop.

Mr. Dickson: In smoking I have used a great many things, and I must admit the shavings are the best.

Mr. Hall: Have you tried cedar bark, thoroughly dry?

Mr. Dickson: Yes, and it is too hot.

Mr. Sibbald: With regard to Mr. Armstrong's question I may say I use very little smoke. As soon as the cover is taken off the bees will face you, and I smoke just to let the smoke touch the bees and they will turn around and run the other way, and then you can take the sections off. My method of shaking them is as follows: I lay a three corner stick on the ground, and take the super in both hands on the outside with the ends of the sections down and just tap gently until they start to run; and then when you get them running pretty well, a few shakes will shake them all off. In the middle of the season I have taken off 500 sections in about an hour, and had them all loaded on my waggon. There is one thing I ought to mention: when the honey is very warm in the afternoon, if you hit too hard you may break the sections. I had one case where there were three or four in the centre broken. I knew what did it, and I know how to avoid it.

Mr. McEvoy: At the close o the season supposing they were a little bit apt to rob?

Mr. Sibbald: You do your work so quick, and when you are shaking them they cannot catch on, and when you get them out you take it away.

Mr. NEWTON : I never turn the point of my smoker down among my sections; I always turn it straight so that the smoke goes above. If it went down it would be apt to taint the sections.

Mr. MCEVOY : Take an ordinary man, and he drives them down with a great smoking, and those bees are going to have revenge, and they set to work and chip the capping.

Mr. NEWTON : As regards escapes, I had one case that sickened me of them; it might have been my fault; my escapes got clogged, and I think I had four nice supers which I did not go back to until the next morning and they were not worth much.

Mr. BROWN : That has been my experience with the escape. I have used only one, and my experience has been like that.

Mr. SHAVER : I am like Mr. Newton; I have one, and that is one too many.

Mr. NEWTON : There has been a great deal of discussion on the American side about bee-escapes, and I find there are a great many who have discarded them on the ground that they spoiled so many sections. One reason is that it is not put on at the right time, and another, it is apt to get clogged. Very often we don't know that our escapes are clogged.

Mr. HALL : I may say I suppose I have taken 22,000 pounds of comb honey, and I have had one super spoiled, and I could afford that because it saves me so much work other ways. I had one super spoiled simply because there were some drones in it.

Mr. POST : I use two dozen Porter bee escapes, and I cannot tell you were they were manufactured, but they are a success with me. In the closing of the season I double up and put two supers on each bee-escape, and carry them from different hives. I put them on one day and go the next morning and take them off.

Mr. MCEVOY : The way it is going now we are all at sixs and sevens.

Mr. CHRYSLER : If the bee escape was taken away from me it would not worry me very much; I could easily find another method of doing it. A person may get into his own way of doing things, and I do not think it should be set down that there has got to be a bee-escape, or a Porter escape, or any other method.

Mr. HALL : I have had imitations of the Porter bee-escape, and the springs were too strong.

Mr. POST : If we cannot agree upon this we had better drop it and leave it to each to do as he chooses.

A MEMBER : Can drone bees pass through the escapes?

Mr. HALL : The one case of failure was blocked up by drones. They cannot pass through them.

Mr. MCEVOY : If they are liable to get clogged it is well to look after that.

Q. Bees going out at entrance at hive hang around on entrance board, as if chilled with cold and wings all in a quiver—what is the cause?

Mr. PICKETT : I have not had a case of this kind and cannot answer. I presume it must mean paralysis. There is one thing lacking; it does not say at what season of the year.

Mr. DICKSON : I asked the question, and I would like an answer to it. It was in the month of May. Two good colonies of bees had come out on the entrance, and just acted as if they were put out too early, and were all in a flutter.

Mr. HALL : Were they dark-colored—shiny?

Mr. DICKSON : No; there was nothing special in their looks; they did not seem to live long. Each morning I would sweep away the entrance board and there would be possibly half a dozen or two dozen the next morning; and when it was warm it seemed to effect them in the same way. I examined the hive and everything seemed all right; one of them was about holding its own, and the other was gaining, and I was determined to make short work, and we finished the hive. I would like to know what was the cause.

Mr. HEISE : How long did that continue?

Mr. DICKSON : It must have been three weeks any way from when I first noticed it.

Mr. PICKETT : Did any of them wander away that you know of?

Mr. DICKSON : I could not say.

Mr. MCKNIGHT : The answer to that question may be paralysis. I have read about it. Is there any such disease known as bee paralysis?

Mr. HALL : I have some in my cellar that will have it in the spring. They call it

bee paralysis, and what it is I do not know, and when they get the good honey it seems to cease; but keep them till next season and it will appear in those colonies again.

Mr. Post: Would re-queening have any effect?

Mr. McEvoy: That is certainly the cure.

Mr. Armstrong: Did you ever remove the queen and find that it disappeared?

Mr. Hall: Yes.

Mr. McEvoy: I have had that experience.

Mr. McKnight: What are the symptoms of bee paralysis?

Mr. Hall: Those are they—the bees quivering and running around.

Mr. McKnight: Have you any idea of the cause?

Mr. Hall: No.

Mr. Chrysler: I heard one man say that he cured it with salt, but I have not very much faith in his ideas.

A Member: Might not this paralysis you are speaking of be caused by getting poison?

Mr. Hall: Poisoned bees run away from the hive.

Mr. Sibbald: I have had a case of poisoning, and a case of what I thought was bee-paralysis, and there is a difference. In poisoning they go out and seem bloated and swollen, and they lie out in numbers in front of the hive in the grass and live there for perhaps a day. With this paralysis they do not seem bloated, and they come out and go back in again, and some would die on the front board.

Mr. Hall: In other words they do not want to leave home.

Mr. Sibbald: And the cure that has been mentioned, the changing of the queen seems to do away with it at once.

Mr. Dickson: In this case it certainly was not poison, because they would run in and come out. There was one I was really sorry to destroy.

Mr. McKnight: I think this disease known as bee paralysis is just as somebody suggested, poisoned bees, and I think that arises from spraying of fruit trees when it is illegal and when it is legal. I believe the spraying of fruit trees is a great detriment to bee-keepers, even when it is carried out in accordance with the law. The law simply prevents people from spraying trees during bloom time. A large proportion of the poison goes upon the foliage of the tree, and the bees need water, and they will gather it anywhere, and I have seen them sipping up the dew from the foliage of these trees where the poison has been dropped. I have seen bees curled up dead upon potato vines, and my opinion is that whether spraying is done in fruit bloom or after, it is still an injury to bee-keepers.

Mr. Hall: My observations with poisoned bees is that ninety-five per cent. of them are bees that have never flown from the hive, and I believe they are poisoned by the worker bees that bring it home. But with regard to these bees that have bee paralysis, as it is called, the hives will have it the next season as well as this seasen. These bees want to get into the hive, and the poisoned bees want to get away.

Mr. Darling: I think Mr. McKnight is right in his statement with regard to poisoning after the bloom has gone. In my section there is not much trouble with spraying, and I have had it before there is spraying done.

Mr. Brown: There is very little spraying done in our immediate section, and I have seen bees acting as Mr. Dickson described, and I cannot put it down to spraying; but I am satisfied that where spraying is done extensively the poison on the foliage will poison the bees.

Mr. Evans: I think the danger in spraying leaves and trees when not in bloom is very slight. Just across the fence from my place is an orchard which was sprayed, and the matter sprayed remained on the leaves a long time, but I found no evil results. I do not think any statement should go out that bees are injured by spraying except when trees are in bloom, and I think we ought to hold the restriction we have now.

Mr. McKnight: Was bee paralysis ever known or spoken of till tree spraying began?

Mr. Post: Yes. I have had cases of so-called bee paralysis about fifteen years ago, and I do not know whether there was spraying done before that date or not.

Mr. Armstrong: I have had it and I laid it down to the queen, and I have killed the queen and it disappeared.

Q. Will honey weighing 12 lbs. to the gallon be improved by exposure in tanks or cans?

Mr. PICKETT: No, and the reason is you lose the aroma or volatile oil to a large degree when exposed any length of time, and I consider you lose really the essence of the honey.

Mr. SHAVER: You can improve it in body, can you not?

Mr. PICKETT: Not much.

Mr. McKNIGHT: I think that is a ridiculous question. But it altogether depends upon the character of the vessel in which it is put and the conditions of the atmosphere whether it improves or deteriorates. There is one thing certain, that if you put honey into an open vessel and keep it there for a certain length of time it will lose its aroma whether it improves in body or fails. The essential oil which gives the honey the aroma is a volatile oil and will pass off if it gets a chance, and it will get a chance in any open vessel; and therefore it will deteriorate so far as losing its aroma is concerned. As to its body, that depends much upon temperature, the condition of the atmosphere and the season of the year.

Mr. HALL: But the beautiful part of the honey is the aroma, and if you cork it up as soon as you take it, you will retain that.

Q. Which is the best, the ordinary make foundation or the Weed maker?

Mr. PICKETT: I have not used the Weed, but if what is claimed for it is true, that it is softer than the ordinary foundation, and strong enough to bear the bees without sagging, I suppose it would be an improvement.

Mr. MILLER: I think it is possible that it may be softer and it may be possible that it will not sag, but I do not consider that is what is wanted. The idea is, will the bee handle it sooner and better, and use it for what he needs it? I have not tested it, but I understand in the Weed the grain of the wax is crushed and it has no longer any granules to be worked by the bee. I think the bee in drawing out comb will pick it out in granules and build comb that way. In building natural comb he uses wax pockets, and it is worked in those granules, and I think the bees prefer to work it that way instead of working something that will pull out like strings. I do not doubt but that the bees will work on the Weed foundation all right, but I think they prefer to work on the foundation and use their own wax.

Q. What is the best method of getting rid of pollen?

Mr. PICKETT: The way I get rid of it, if I have too much of it, I destroy the comb. I would be pleased to hear from some others in that line.

Mr. HALL: That question has been pretty well answered in discussion on Mr. Newton's paper—by giving them room in the hive to put in.

Mr. NEWTON: I think there are a couple of gentlemen here who have misunderstood Mr. Hall in one thought, and I think he should have a moment to explain himself. It is about leaving perforated metal between the comb supers and the hive—does he do it or does he not do it?

Mr. HALL: We use the perforated metal only for comb honey at the time of hiving a swarm, and only on contracted hive, and we do not go back to take it off until it is convenient. Any hive in the yard that has not swarmed has no excluder. I want the excluders only for extracting, so that we may work quickly.

Mr. SHAVER: Do you not get a little better honey with the queen excluders than without?

Mr. HALL: No. Some days we get an abundance of pollen in our sections, and some years we take a very large crop of comb honey. Some years, I may say, out of perhaps four or five thousand pounds we may have twenty sections with pollen in. Other years the hives and swarms, treated just the same, we would have 200 or 300 sections with pollen in. What the reason is, I do not know. There are some races of bees that do not know much, and do not know where to put the pollen.

Mr. McKNIGHT: The excluder is used to prevent the queen from going up and depositing eggs above and detroying comb honey; is that likely to occur if contraction is not practised?

Mr. HALL: Yes, sir.

Mr. McKNIGHT: Not often in my experience.

Mr. HALL: I did not say how often; there are some very stupid bees that do not know where to put the pollen. I got some bees a few years ago; they were grand bees to handle and build comb as long as they could do it at home, and they were very pro-

lific. But they did not know their own home, and you can find them in every hive in the yard. They do not know enough to sting or to put the pollen in the right place. They were the stupidest bees I ever had, and the prettiest I had.

APPOINTMENT OF INSPECTOR OF HONEY FOR PARIS EXPOSITION.

The meeting felt it would be desirable to recommend to the Government a fit and proper person to inspect the samples in the Canadian honey exhibit before shipment to Paris, and it was moved by Mr. Couse seconded by Mr. McEvoy,

"That this Association recommend to the Government Mr. C. W. Post for the position of Inspector of the honey exhibit going to Paris."

The motion was carried.

The Association decided to make no recommendation with regard to the appointment of a person to accompany the exhibit to Paris.

THE BEE JOURNAL.

The question of the Bee-keepers' Association taking over the Canadian Bee Journal was discussed, but the opinion of the meeting was that the Association was not in a position to undertake the management of the Journal.

Mr. Darling moved and Mr. Evans seconded, "That this Association recommends to the Board of Directors that for another year we give the Canadian Bee Journal to the members on the same terms as in the past." Carried.

On motion of Mr. McEvoy, seconded by Mr. Shaver, the meeting adjourned.

DIRECTORS' MEETING.

At the Directors' meeting following the annual meeting, the following business was transacted:

Mr. W. Couse was re-appointed secretary and Mr. Emigh, treasurer. The sum of $200 was appropriated to affiliated societies, but no society was to receive more than $20. There was a grant of $25.00, $10.00, and $10.00 made to the Toronto Industrial Exhibition Association, the Western Fair Association of London, and the Canada Central Exhibition Association of Ottawa, respectively.

The President, Vice-President and the second Vice-President were appointed an Executive Committee.

It was decided that the Canadian Bee journal would be given as a premium to the members of the current year.

Mr. Darling and Mr. Post were appointed a committee to send samples of honey to Professor Shutt of the Experimental Farm at Ottawa, to ascertain the percentage of water in the different samples.

BY-LAWS.

1. This Association shall be known as the Ontario Bee-keepers' Association, and shall be composed of those interested in bee-keeping who become enrolled as members by paying the annual membership fee of one dollar.

2. A general meeting of the members of this Association shall be held once a year, and shall be known as the Annual Meeting, the year to begin with the election of officers at such Annual Meeting and terminate on the election of their successors at the next Annual Meeting. At this Annual Meeting, or at any other general meeting of the members of this Association, ten members in good standing shall constitute a quorum.

3. The time and place of holding the next Annual Meeting shall be fixed by the members present at the Annual Meeting,

4. The Board of Management shall consist of a President, two Vice-Presidents and nine Directors elected one from each of the following twelve divisions :—

Division No. 1.—Stormont, Dundas, Glengarry, Prescott and Cornwall.

Division No. 2.—Lanark, Renfrew, Carleton, Russell and Ottawa.

Division No. 3.—Frontenac, Kingston, Leeds, Grenville and Brockville.

Division No. 4.—Hastings, Addington, Lennox and Prince Edward.

Division No. 5.—Durham, Northumberland, Peterborough, Victoria and Haliburton.

Division No. 6.—York, Ontario, Peel, Cardwell and Toronto.

Division No. 7.—Wellington, Waterloo, Wentworth, Dufferin, Halton and Hamilton.

Division No. 8.—Lincoln, Niagara, Welland, Haldimand and Monck.

Division No. 9.—Elgin, Brant, Oxford and Norfolk.

Division No. 10.—Huron. Bruce, Grey and Perth.

Division No. 11.—Essex, Kent, Lambton, Middlesex and London.

Division No. 12.—Algoma, Simcoe, Muskoka, Parry Sound, Nipissing and Manitoulin.

Also one Director from the Ontario Agricultural College and Experimental Farm. The Board of Management so elected shall appoint from among themselves, or otherwise, a Secretary and a Treasurer, and shall also appoint at least three of their number as an Executive Committee.

5. Five members of the Board shall constitute a quorum.

6. Vacancies on the Board by death or resignation may be filled by the President, subject to the approval of the Executive Committee.

7. The officers of this Association shall be elected by ballot, with the exception of the Auditor, who may be elected by an open vote of the Association.

8. It shall be the duty of the President to preside at all meetings of this Association; to call for reports; to put motions when seconded; to decide upon questions of order and to declare the result of ballots and elections. The President in connection with the Secretary, shall have power to call special meetings when necessary. The President shall be *ex officio* chairman of the Board of Directors, and shall call it together when necessary.

9. In the event of the death or absence of the President, the Vice-President shall discharge his duties.

10. It shall be the duty of the Secretary to keep and preserve the books of the Association; to call the roll and read the minutes at every meeting of the Association; to conduct all correspondence of the Association; to receive and transfer all moneys received for fees and otherwise to the Treasurer, having taken a receipt for the same; to make out a statistical report for the Association and for the Government; to furnish the officers of the County and District Associations with forms for organization and annual reports, and to give notice of Association and Board meetings through the press or otherwise.

11. It shall be the duty of the Treasurer to furnish such securities for the moneys of the Association as the Board may determine; to receive from the Secretary all moneys belonging to the Association and to give receipts for the same; to pay them out on order endorsed by the President and Secretary, and to render a written report of all receipts and disbursements at each Annual Meeting.

12. Any County or District Bee-Keepers' Association in the Province of Ontario may become affiliated to this Association on payment of five dollars, which shall be paid to the Secretary on or before the first day of June in each year; but every local Association so affiliated must have on its membership roll at least five members who are also members of the Ontario Bee-Keepers' Association at the time of its affiliation, and must continue to have a like number of its members on the roll of this Association while it remains in affiliation.

13. Every affiliated Association shall receive an annual grant out of the funds of this Association. The amount of such grant shall be fixed by the Board from year to year.

14. All grants to affiliated Associations shall be expended in prizes for honey shows, or for shows of apiarian appliances, or for lectures on subjects pertaining to bee culture, or for advertising district or county meetings, or for any or all of these, and for no other purpose.

15. Every affiliated Association shall report to the Secretary of this Association (on a form to be supplied by the Secretary) before the first day of December in each year, which report shall be signed by the President and Secretary of the affiliated Association.

16. County or District Associations seeking affiliation should forward to the Secretary an application according to the following form :—"We, whose names are written in the accompanying form, having organized ourselves into a County (or District) Association to be known as County (or District) Association No. —, desire to become affiliated to the Ontario Bee-Keepers' Association, and we agree to conform to the Constitution and By-Laws of said Association."

Form of application as follows :—

Names of those already Members of O. B. K. A.	P.O. Address	Fees.	Names of those not already Members of O. B. K. A.	P.O. Address	Fees.	Remarks.

17. Every affiliated Association that neglects or refuses to pay the annual affiliation fee, or neglects or refuses to forward to the Secretary the annual report on or before the date fixed, may be deprived of their affiliation privileges by the Board.

18. Should an affiliated Association become defunct after the payment to it of the grant from this Association, any unexpended balance of said grant shall be forfeited and paid over to the Treasurer of this Association.

19. Each affiliated Association shall be entitled to the privilege of two representatives at the meetings of this Association in addition to those who are already members of this Association, and such representatives shall be entitled to all the rights and privileges of members of this Association.

20. Every delegate from an affiliated Association shall furnish to this Association a certificate, signed by the President and Secretary of the body which he represents, showing that he has been duly appointed a delegate of such Society.

21. Each affiliated Association shall be entitled to the services of an Association lecturer (when such exists) once in each year, half the expenses connected with such lecture to be borne by the District or County Association and half by this Association.

22. The order of business by which the meetings of this Association shall be governed shall be in the discretion of the President, but subject to appeal to the meeting when objection is taken, when a majority vote of the members present shall decide on the objection, and in such cases the vote of the majority shall be final.

23. These By-Laws may be amended by a majority vote of the members present at any Annual Meeting, or at a special meeting of the members called for the purpose of considering the same, and of which at least two weeks' notice shall be given by public advertisement.

APPENDIX A.

EXPERIMENTS IN APICULTURE.

I regret to say that the past season has been one of the poorest the bee-keepers of Ontario have had for many years. All over the Province of Ontario the winter of 1898-99 was unusually severe. Not only was the temperature low at different times, but in several instances the low temperature prevailed for a considerable period of time. I looked for great mortality among bees, especially those wintered outside, and when spring reports came in these expectations were only too fully realized. Judging from general reports, I believe that during the winter mentioned there has been the heaviest loss in bees experienced for at least eighteen years.

In addition to the above, the summer of 1899 will long be remembered by bee-keepers as opening up with fairest promises for those bees which wintered. All the conditions appeared to be very favorable to the secretion of nectar, and the careful bee-keeper made every preparation for a large honey crop.

Clover came in blossom and day after day passed without the bees doing much on it. Dry weather followed a prolonged season of favorable weather without either giving a honey harvest. The thistle and linden bloom passed, and nearly all bee-keepers in Ontario had disappointment instead of a honey crop.

In connection with the shortage of honey, it may be well to mention that the above report in connection with the mortality in bees and the shortage of the honey crop holds good for the districts throughout Canada where bee-keeping is carried on extensively, and the shortage in the honey crop was equally marked in the United States.

Summing up the above report, we find the following:

1st. The winter of 1898-99 resulted in a largely decreased number of colonies of bees in Ontario to begin the summer of 1899.

2nd. An unfavorable honey season during the summer of 1899, with little swarming and increase of colonies. Other colonies did not gather enough honey to provide the bees with sufficient stores to carry them through the present winter. In many cases careless and discouraged bee-keepers did not go to the expense necessary to provide food for these bees, which will mean the loss of such.

3rd. The shortage in the honey crop of 1899 will leave the market very bare of honey, and it has increased the wholesale and retail price of honey.

This being the case, those bringing their bees safely through the winter should give them every care and attention tending to put them in the most favorable condition for gathering a large honey crop, and whatever honey may be secured should be marketed at good prices.

While entailing a heavy loss in outside wintering the exceptional winter has made our experiments of greater value. Just as the chain is strong only as it is so at the weakest link so it is in the wintering of bees.

The aim and object of the bee-keeper should be to so prepare his bees that he can look forward to their successful wintering with a reasonable degree of certainty. It should not be satisfactory to have the assurance that they will winter through an average season, but we must and can prepare them that they will winter with just as great a certainty as any other stock upon the farm.

In the experiments in wintering bees which we have conducted we have divided them into two leading heads.

Cellar Wintering and Wintering on Summer Stands.

We have had distinct and new features introduced in our experiments in connection with cellar wintering, and these cannot be brought too prominently before the bee keepers of the Province, and in fact any country in which similar winters prevail and in which bee-keeping is a department of agriculture.

The system adopted by us in our experiments is artificial heat; and, in connection therewith, the drawing out of the cellar impure air and replacing it with air from outside, warmed before reaching the bees.

The first cellar in which this experiment was carried on is constructed as seen in Fig. I.

It is a combination of five cellars, or rather a large stone cellar divided into five parts, four of which were used for the bees, and these repositories communicated with one another by means of doors and also by means of openings in the dividing walls, fourteen inches square near the top of the wall, and through the same openings a six inch stovepipe ran. These openings allowed a circulation of air from one room to another, as seen in Fig. I. A stove was placed near the cellar door, which communicated with the

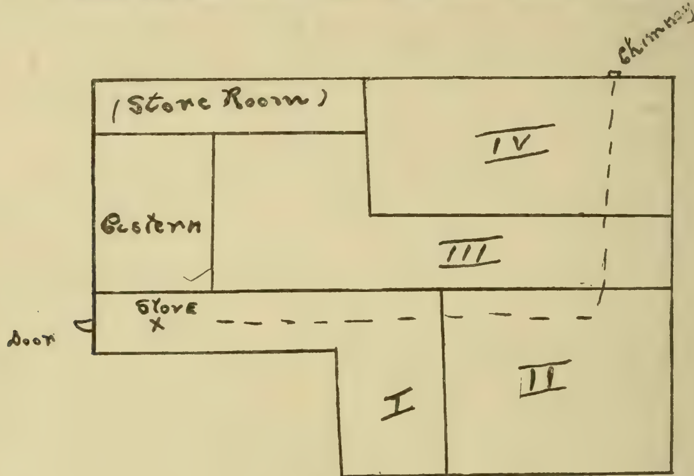

FIG. I.

outside; and through this door the fresh air from the outside had access. The air in its natural course, by means of the openings around the stovepipe, passed from room to room; and finally in the fourth room passed out by means of a similar opening in the chimney—the same chimney into which the stovepipe entered. This chimney has in addition a pipe entering it from the stove used in the living room above. Coal was used after finding wood unsatisfactory. During $3\frac{1}{2}$ months, using 2,550 lbs. of stove coal, the temperature kept in No. 1 and 4 was 46°; in No. 2 and 3, 45°. The objection to having the air pass from one repository to another was found to be that as it passed from one to another it became more and more impure; however, the results were very satisfactory and much superior to the best known previous methods.

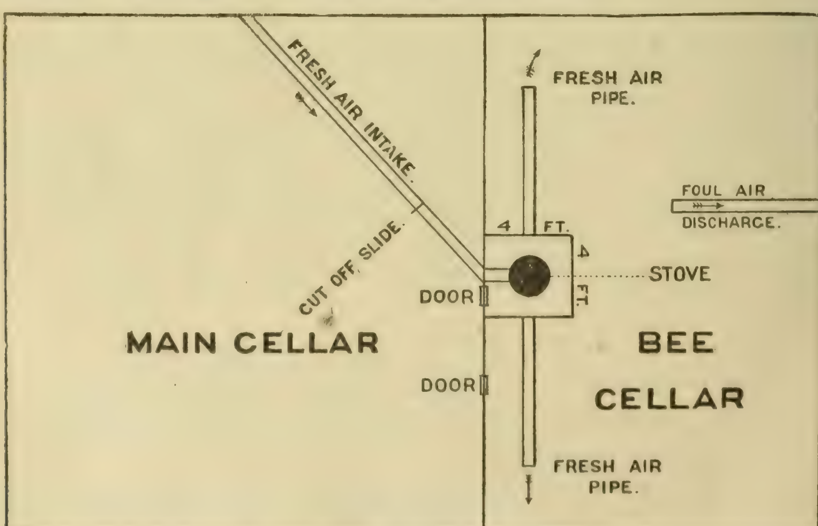

FIG. II.

A more perfect system was then adopted as in Fig. II.

This is a plan which can be adopted by almost any person having an ordinary good sized cellar ; and after carefully testing this system I know of no better, economy, convenience and results taken into consideration. It would pay any one with forty or even a less number of colonies to winter.

The stove here used was not a self-feeder—a decided advantage—requiring less care and giving a more even temperature.

For 100 colonies the fresh air pipe should be 14 in. in diameter with a cut-off slide as a regulator. The foul air pipe may be allowed to discharge through the cellar window into the open air, but a better plan is to connect it with a chimney ; one having a pipe coming from a fire would be preferable. The plan just given is the one I would strongly recommend to bee-keepers.

OUTSIDE WINTERING WITH PROTECTION.

Of the various experiments in outside wintering the following has proved the most satisfactoıy.

Outer cases were contsructed of $\frac{3}{8}$ inch stuff and painted a dark color, to contain four colonies, two to stand side by side and the pairs back to back, as in Fig. III., with room

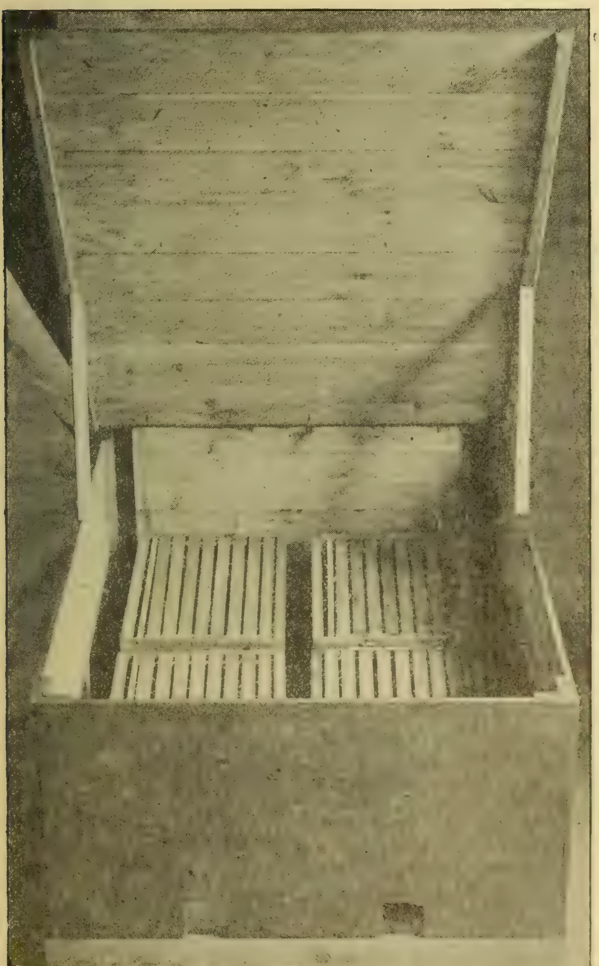

FIG. III.

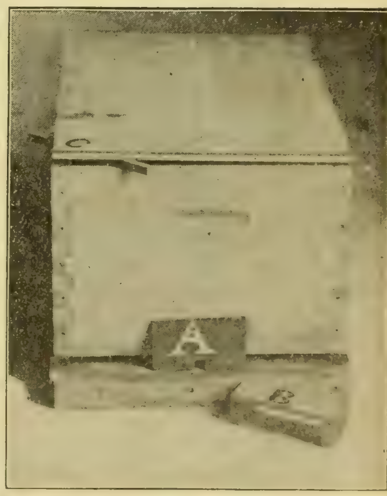

FIG. IV.

for two inches of packing between the hives and the outer case sides, and one inch between the hive sides and backs. At the bottom, sufficient room was made for half an inch of

packing at the front, and a little over an inch at the back, thus giving the hive, when packed, a slightly forward pitch.

The entrances run the full width of the hive, $12\frac{1}{2}$ inches. To prevent the front frcm completely closing the entrance, the plan indicated in Fig. IV. was adopted.

On the alighting board was placed a bridge six inches long (Fig. IV) the width of the alighting board; under the board and at the end underneath was nailed a piece $\frac{7}{8}$ inches square and the length of the board width. When this bridge is placed on the alighting board and the hive packed, it offers underneath a passage for the bees to go in and out on the alighting board and underneath the packing alone. Another important point is a piece of cardboard (a. Fig. IV) six inches wide, an inch and a little more in depth in the centre of the lower edge; a passage one-half inch square is cut in the cardboard. The cardboard is put between the front of the hive and the bridge. When packing, the pasteboard is kept just above the entrance to the hive; this leaves the board projecting $\frac{3}{8}$ inch below the bridge. The $\frac{3}{8}$ inch projection is a matter of great importance. The bees should be packed before cold nights become frequent, say October 1st, and yet it is not advisable at that time to contract the entrance to $\frac{1}{2}$ inch wide; for this reason the cardboard is kept above the entrance. It is allowed to project $\frac{3}{8}$ inch below the bottom of the bridge board to allow the bee-keeper, when settled cold weather comes, to pass a long-bladed knife or sharp tool in at the entrance of the outer case and with this draw the cardboard down to the bottom board, thus leaving the entrance to the hive only $\frac{1}{2}$ inch wide and deep. This should be done about December 1st or when winter appears to be setting in. The outer covers were removed from the hives; where quilts were used they were loosened, and a block put under the rear corner; for the purpose of illustration the block is put under the front corner in Fig. IV. *c.*, leaving an opening for the air to pass upward from the hive. In about half the number of colonies honey boards $\frac{3}{8}$ inch thick were used instead of quilts; they were loosened and a similar block put under one corner. This, too, allows the air to pass upward through the hive. Dry leaves are now packed loosely about the hives, and ten to twelve inches on top, the last five or six inches of top packing being put in about the time that the entrance was contracted. Planer shavings and dry forest leaves were used. I prefer dry forest leaves, especially maple and oak leaves. When the cardboard had been drawn into place at the entrance, a board ten or twelve inches wide was placed in a slanting position against the outer case, protecting from wind, sunlight and snow the entrance in the wintering case.

The loss during the severe winter of 1898-99 was heavy, compared with cellar wintering.

In No. II. apiary the winter and spring loss, May 24th, 1899, stood as follows:

	Alive.	Dead.		Alive.	Dead.
Clamp No. 1..........	3	1	Clamp No. 11..........	4	0
" " 2..........	1	3	" " 12..........	2	2
" " 3..........	3	1	" " 13..........	4	0
" " 4..........	2	2	" " 14..........	3	1
" " 5..........	3	1	" " 15..........	4	0
" " 6..........	3	1	" " 16..........	4	0
" " 7..........	2	1	" " 17..........	4	0
" " 8..........	1	3	" " 18..........	4	0
" " 9..........	1	0		—	—
" " 10..........	3	1		51	17

In No. III. apiary:—

	Alive.	Dead.		Alive.	Dead.
No. 1................	3	1	No. 7................	3	1
" 2................	2	2	" 8................	4	0
" 3................	3	1	" 9................	3	1
" 4................	4	0	" 10................	0	4*
" 5................	4	0	" 11................	4	0
" 6................	3	1	" 12................	4	0

*In clamps Nos. 10 and 14 the top packing had been left out, and, in all probability, during the prolonged seasons of low temperatures, the bees literally starved to death in the midst of plenty, after having consumed the stores upon which they clustered.

	Alive.	Dead.
No. 13	3	1
" 14	1	3*
" 15	3	1
" 16	3	1
" 17	4	0
" 18	4	0
No. 19	3	1
" 20	4	0
" 21	1	3
" 22	3	1
	—	—
	66	22

*In clamps Nos. 10 and 14 the top packing had been left out, and, in all probability, during the prolonged seasons of low temperatures, the bees literally starved to death in the midst of plenty, after having consumed the stores upon which they clustered.

Outside Wintering Without Side and Bottom Packing.

We have had, until last winter, four years of unbroken success in wintering a hive of bees having the brood chamber in two parts, the first set of frames, ten in number, measuring $14\frac{3}{4} \times 8\frac{1}{2}$ inches, and the upper ten $14\frac{3}{4} \times 4\frac{1}{2}$ inches. As before, the only protection offered was about five inches of packing in a super above the frames. The bees perished. See Fig. V. and Fig. VI. for difference between this hive and the ordinary hive. The great difference is that the bees can communicate through the centre of the cluster in Fig VI., and Fig. V. only through the outside, but even this will not answer in a locality where the temperature remains for a considerable length of time as low as 20° below zero.

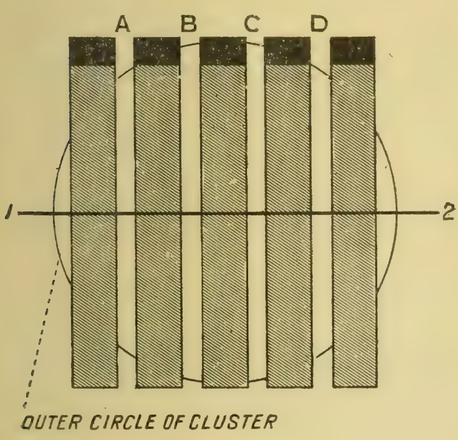

Fig. V.

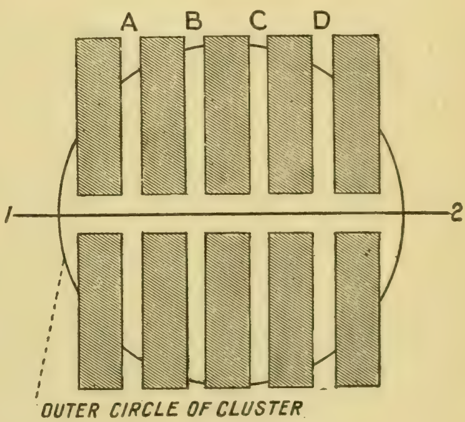

Fig. VI,

With migratory bee-keeping on the increase, a rapid method of preparing the bees for shipment is desirable. Last year's experiments in moving bees with a portico at the entrance was repeated with entire success. The bees were, as during the previous season, moved to fall pasture with the portico entrances attached to the fronts of the hives, and with the same success. In addition, having orders for bees in various parts of the Dominion, including British Columbia and Prince Edward Island, sixty-five colonies were prepared and shipped in the above way, and in every case the bees reached their destination in safety—a very severe test.

Comb and Extracted Honey,

On account of the failure in the honey crop no results of any value could be obtained in connection with the production of comb and extracted honey.

Stores Consumed by Bees in Autumn.

Twenty colonies were weighed on Oct. 9th, and again Nov. 5th, to acertain the loss in weight before putting in the cellar. The weights on No. 69 and No. 30 were lost—they are therefore not taken into account. The results were as follows :

	Oct. 9th.	Nov. 5th.	Loss.
No. 36	47	44½	2½
" 71	41	40	1
" 34	41	40	1
" 32	43	42½	½
" 69	weight lost	47	
" 67	45½	42½	3
" 30	45	43	2
" 28	50	46½	3½
" 65	50	48½	1½
" 63	46	43	3
" 15	51½	50½	1
" 17	50	47	3
" 19	44	40½	3½
" 21	47½	45	2½
" 25	39	36	3
" 27	42½	41	1½
" 27½	41	38	3
" 29	42½	38½	4
" 30	weight lost	40	
" 31	41½	39	2½

Eighteen colonies lost 42 pounds. Greatest loss of any colony, 4 pounds ; the least loss, ½ pound ; the average loss per colony, 2 pound 5⅓ ounces.

Foul Brood.

No sign of foul brood was detected in the combs built upon foundation made from beeswax injected with the germs of foul brood.

Better Methods of Keeping Bees.

In conclusion permit me to impress upon bee-keepers the fact that we have found that large honey yields can only be secured by careful attention to the business. The points in management which require especial care are good wintering, providing plenty of stores during spring and keeping the bees together during the season ; increase of colonies should be avoided rather than encouraged.

Too many bee-keepers are content with smaller yields than can be obtained.

R. F. Holtermann,

Apiarist.

Note.—This report of Experiments in Apiculture was received after the report of the Ontario Agricultural College had been sent to the printer, and, as it was not convenient to include it in that report, it was thought advisable to publish it in this report.